



SATURDAY, MAY 9, 1874.

Locomotive for the New York Elevated Railroad.

The accompanying engraving is a side elevation of one of the locomotives in use on the New York Elevated Railroad, one side of the cab or housing being removed.

The engine, which was designed by Mr. D. W. Wyman, Superintendent of the road, has cylinders 7 by 10 inches and is carried on four wheels 30 inches in diameter, all of which are drivers. The cylinders are placed inside of the wheels and just in front of the forward axle, and are so inclined as to raise them high enough for the guides to clear the axle. The connecting rods take hold of a crank-shaft placed between the driving-axes and at an equal distance from each. An outside

These engines weigh about 8,000 pounds, ready for work. Their ordinary train consists of two passenger cars weighing 11,000 pounds each, and each seating 48 passengers; but three cars are frequently hauled. The length of the road is very nearly four miles; in that distance there are seven stops and the run is made in 20 minutes. A day's work is about ten round trips, or 82 miles. The consumption of coal was accurately measured last summer and gave 500 pounds of anthracite coal, which is the fuel used, while running 82 miles, an average of 6.1 pounds per mile run. A gallon of lubricating oil runs an engine six days, or 492 miles. The heaviest grade on the road is 127.3 feet per mile, and the shortest curve is of 56 feet radius. The wheel-base of the engine is five feet. They are said to run very smoothly and with very little pitching or oscillation.

Three of these engines have been in use over a year and have given so much satisfaction that a fourth is now being built in the company's shop. The extension of the road, from the present terminus across the city to the Grand Central Depot, which the company has received authority to build, and

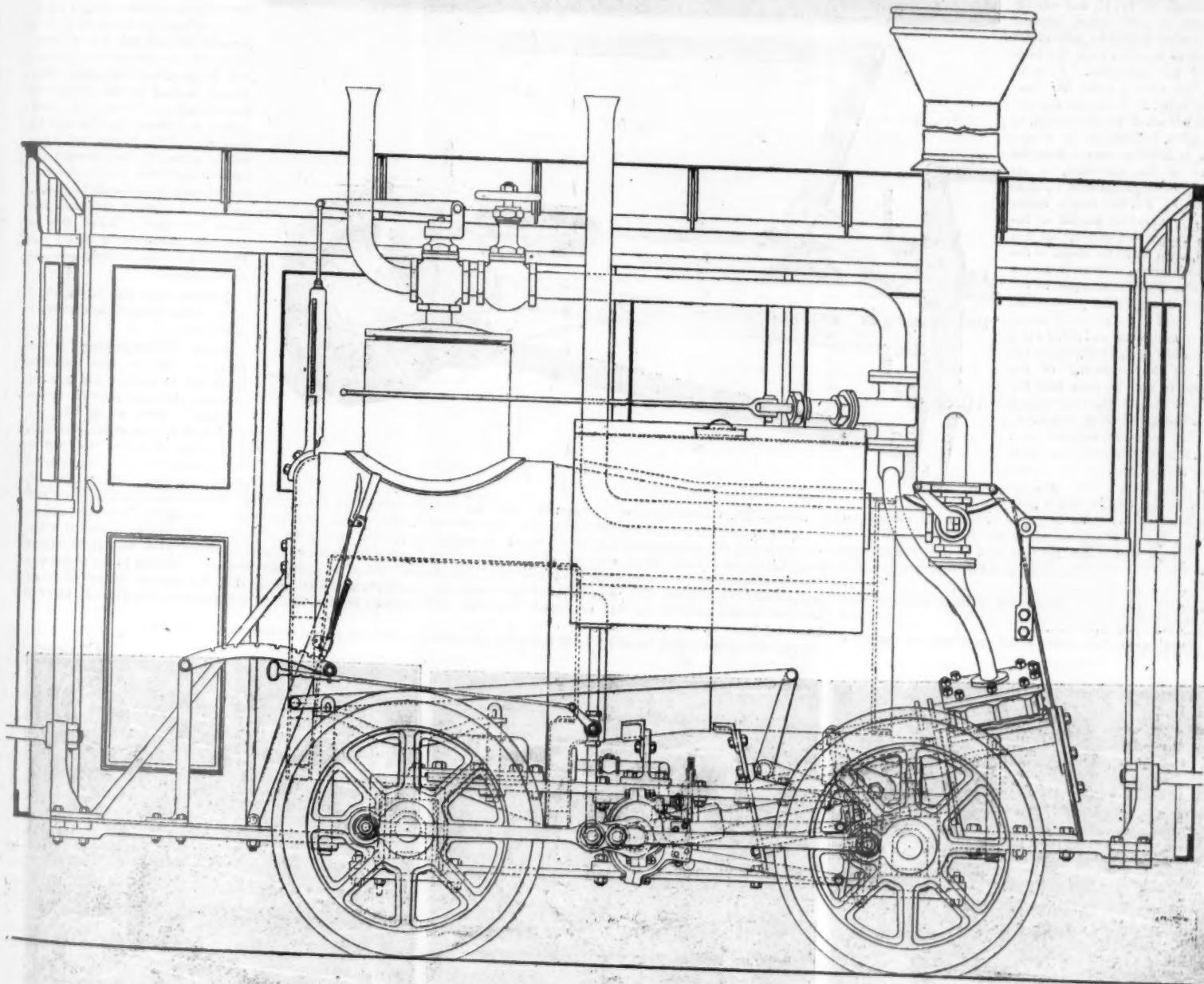
Answer. It must be so arranged that the locomotive can be run either backward or forward, and so that the motion of the wheels can be reversed quickly and with certainty. It should enable the runner to employ the greatest power of the engine by using steam during the whole or nearly the whole of the stroke of the pistons, or when less power is required, to use the steam more economically by working it expansively, which is accomplished with the present appliances by changing the travel of the valve.

QUESTION 179. How is the valve-gear constructed so as to run the engine either backward or forward?

Answer. As already explained, in answer to question 73, two eccentrics are provided for each cylinder. These are set so that one of each pair will run the locomotive in one direction, and the other two in the reverse way.

QUESTION 180. How must the eccentrics for each cylinder be set in order that the one may run the engine forward and the other backward?

Answer.—This can be best explained by reference to fig. 100, in which one of the pistons, P, is represented at the beginning



LOCOMOTIVE FOR THE NEW YORK ELEVATED RAILROAD.

Designed by D. W. Wyman, Superintendent.

crank and parallel-rods on each side connect the driving-shaft with the driving-wheels, the arrangement being exactly the same as that of an engine with six coupled wheels, except that in this case the middle pair of wheels is omitted, the axle being retained.

Steam is taken from a valve placed on top of the dome, from which a pipe passes forward to a throttle-valve placed over the front end of the boiler. From this a steam pipe passes down each side of the boiler to the steam-chests, which are on top of the cylinders. The valve-motion is of the ordinary shifting-link type, the eccentrics being on the intermediate cranked shaft. The exhaust pipe has two branches, one leading into the smoke stack directly, the other passing through the tank and then upwards through the roof of the cab. A small saddle tank is placed over the barrel of the boiler. The frames are bar frames like ordinary engine frames, and are well braced together. The wheels are of Moore's patent, a cast-iron center with steel tire and wood packing between, and are said to be well adapted to the road. The whole engine is covered over with a cab or housing provided with windows all round and a door at each side of the foot plate.

which will soon be constructed, will, it is expected, bring a considerable increase of traffic and make additions to the equipment necessary. All of the engines will be built on the plan of the one here described, which is regarded as the company's standard pattern.

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THE CATECHISM OF THE LOCOMOTIVE.

By M. N. FORNEY, Mechanical Engineer.

PART X.—(CONTINUED).

THE VALVE-GEAR.

QUESTION 177. What is meant by the valve-gear of a locomotive?

Answer. By the valve-gear is meant the arrangement of eccentrics, rods, links, rockers, etc., by which the valves are moved and their motion regulated.

QUESTION 178. What is required of the valve-gear in working a locomotive?

of the backward stroke, and the valve V has the requisite lead and is just about to open the front steam port. It is obvious that, in order to complete the backward stroke of the piston, the front port must be opened to admit steam into the front end of the cylinder, and therefore the valve must be moved in the direction indicated by the dart a. To do this, the upper arm of the rocker r must move in the same direction, and the lower arm must be moved the reverse way by the eccentric. If the crank is intended to move in the direction indicated by the dart N, then the center of the eccentric must be above the center of the shaft or axle, in order to move the rocker in the direction indicated by the dart e. Supposing, however, it was intended to move the crank the reverse direction, as shown by the dart N in fig. 101; it is evident in that case that the valve must be moved in the same direction as before, in order to open the front steam-port and thus admit steam to force the piston back. But if the crank turns in the direction shown by the dart N, fig. 101, then the center of the eccentric must be placed below the center of the shaft or axle, to move the lower rocker arm in the direction of the dart e and the valve in that indicated by a. It will thus be seen that

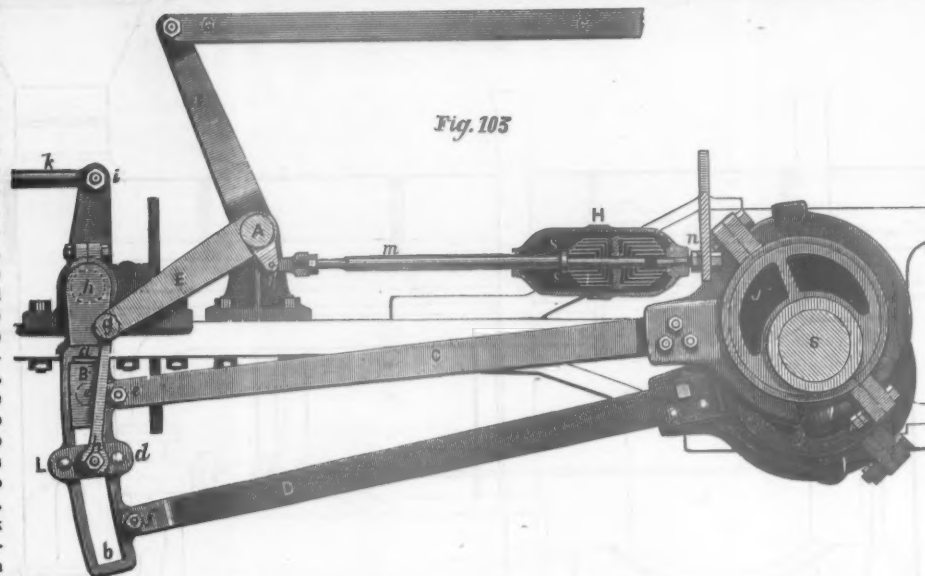
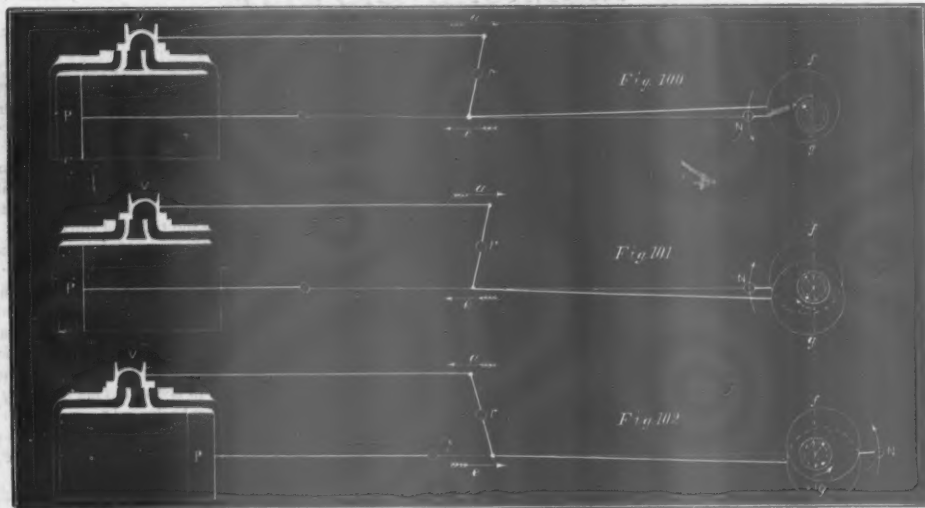
the centres of the eccentric for running forward and that of the one for running backward must be placed, the one above and the other below the center of the axle at the beginning of the stroke of the piston, as shown in fig. 101.

QUESTION 181. Why is it that the centres of the eccentrics are not placed opposite to each other on the axle?

Answer. Because before the beginning of the stroke of the piston it is necessary to move the valve from its middle position a distance equal to the lap before the steam-port begins to open. If we have a valve like that shown in fig. 10— that is, without any lap—the centres of the eccentrics could be placed at right angles, or, as mechanics say, "square" with the crank, as was shown in fig. 11, and exactly opposite to each other, because such a valve begins to take steam as soon as it moves from the middle of the valve-face. If, however, we have a valve like that shown in fig. 27, it is plain that before it will admit or take steam, as it is called, in either of the steam-ports, it must be moved from the centre of the valve-face, or its middle position, a distance equal to the lap, L . For this reason, therefore, the eccentric, instead of being placed at half-throw,* as it is called, must be so far ahead of the middle position as to have moved the valve a distance equal to the lap, and if any lead is given to the valve, equal to the lap and lead together. In figs. 100 and 101, fg is a vertical line at right angles to the crank at the beginning of the stroke. It will be seen that the centre of each of the eccentrics is set far enough ahead of this line to give the valve the required lead. When the piston reaches the back end of the cylinder, the two eccentrics will occupy the position shown in fig. 102, in which position the lower one would move the crank in the direction of the arrow, N , and the upper one in the reverse direction. It will be seen that in this position b of the eccentrics are again ahead of half-throw, when the piston is at that end of its stroke.

QUESTION 182. How is the motion of either eccentric communicated to the valve?

* This would be at right angles to the crank when the piston is at the end of the stroke.

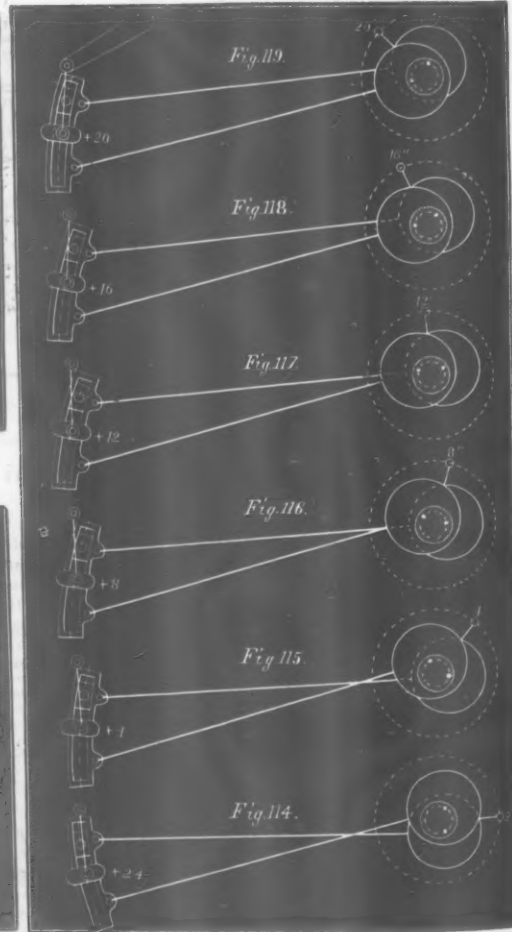
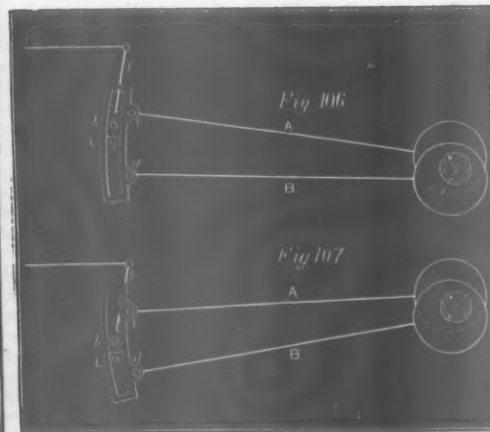
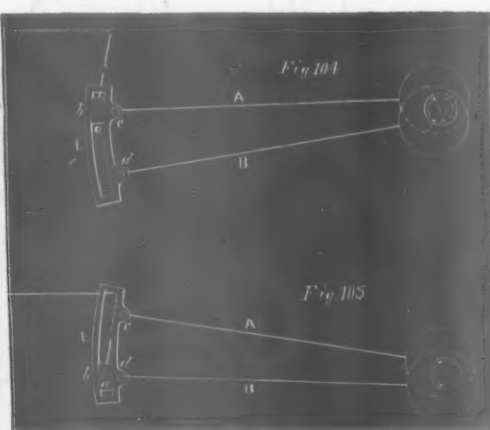
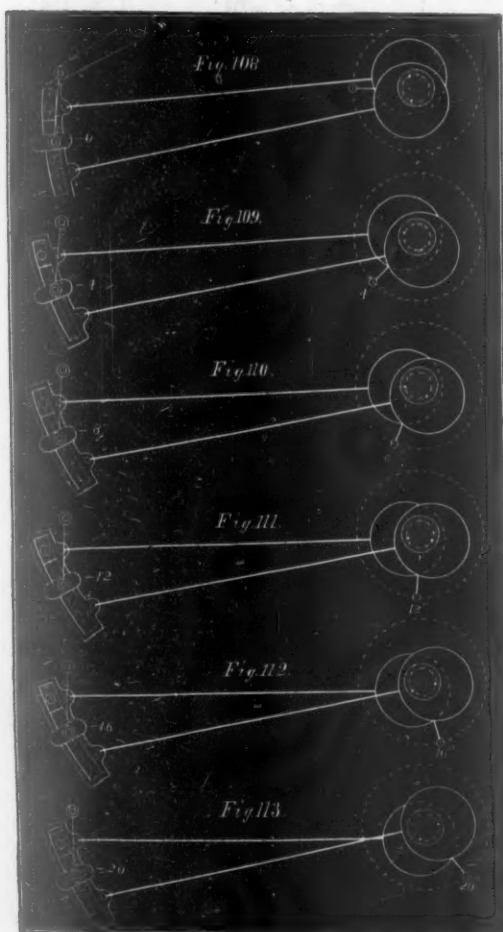


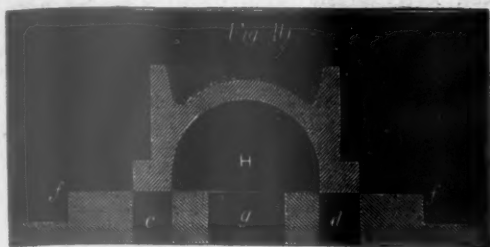
eccentric rod, which is usually used for the forward motion, will be imparted to the rocker, and thence to the valve, and when the link is in the position shown in fig. 105, that the valve will be moved by the lower or backward eccentric-rod B . In order to reverse the engine, it is then only necessary to provide the means of raising and lowering the links. This is done by a shaft, A , fig. 108, called a *lifting-shaft*, which has two horizontal arms E , one for each link, and a vertical arm, F . The links are suspended from the ends of the horizontal arms by rods or bars, g h , called *link-hangers*, which are connected to the links and to the arms above by pins, which enable the hangers to vibrate freely. The lower pin is attached to a plate d , h , called a *link-saddle*, which is bolted to the link. The vertical arm of the lifting-shaft is connected by a rod, G , G , called the *reverse-rod*, to a lever in the cab called a *reverse-lever*, the construction of which will be explained hereafter. This lever is worked by the locomotive runner, and by moving the upper end of it forward, the link will be lowered, and the rocker and valve will be moved by the forward eccentric; and if the reverse-lever is moved back, the link will be raised, and the backward eccentric will move the valve. When this is done, the valve-gear is said to be thrown into the forward or backward motion.

QUESTION 183. How is the travel of the valve changed by the motion of the link?

Answer. By either raising or lowering the link, so that the link-block and rocker-pin will be some distance above or below the eccentric-rods. Thus in fig. 104, the motion of the upper eccentric-rod, and in fig. 105 that of the lower or back eccentric-rod is communicated to the rocker-pin and the valve. If, however, the link should be raised so that the link-block and rocker-pin are somewhat below the upper or forward eccentric-rod, as shown in fig. 106, then the motion imparted to the rocker and valve will partake somewhat of that of the upper and also of the lower eccentric-rod. So long as the rocker-pin is above the centre of the link, the motion of the valve will partake most of that of the upper or forward rod, and the

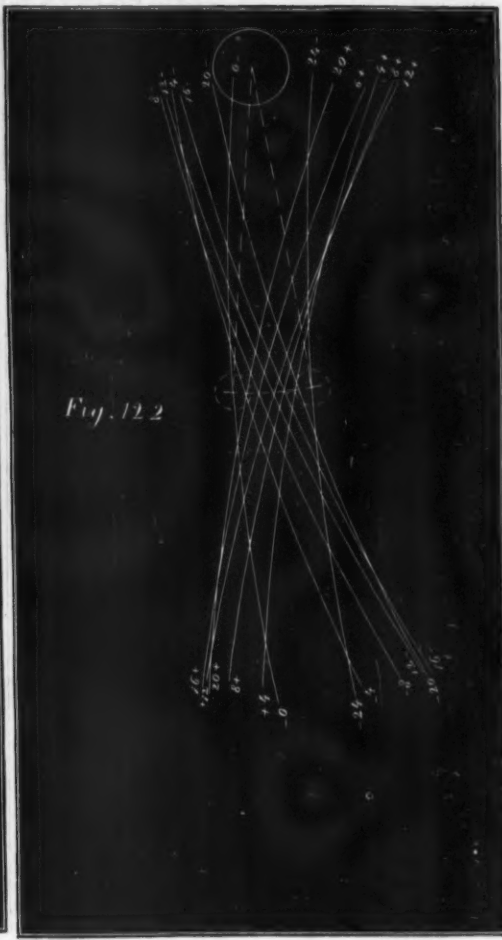
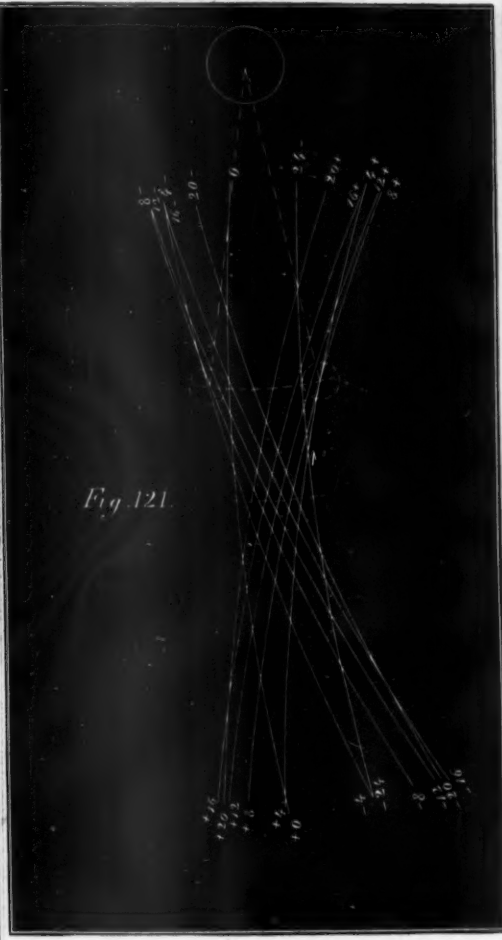
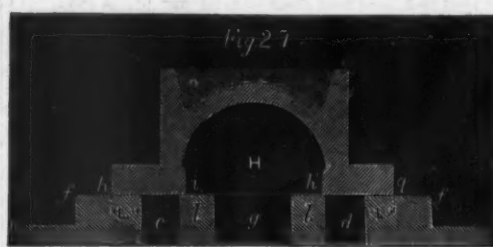
† Only one of these is shown in the engraving.





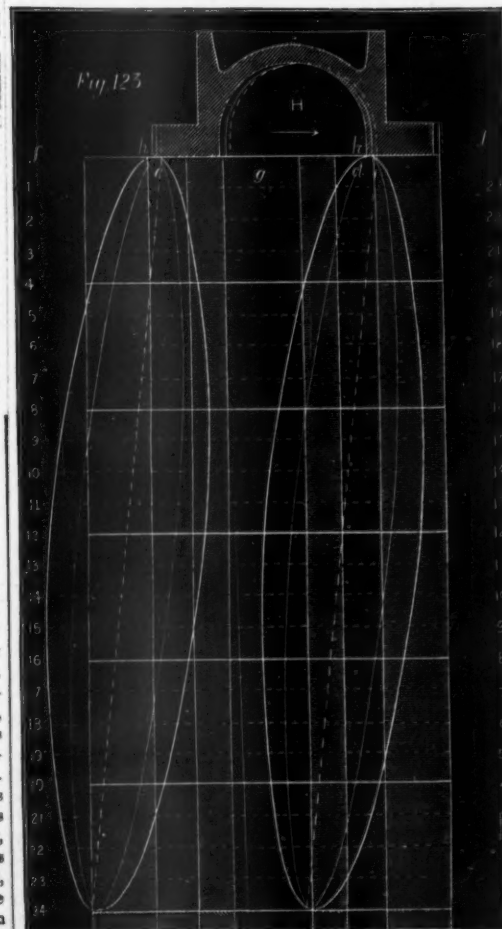
QUESTION 184. What is the effect of this variation of travel on the working of the valve and the admission and release of steam to and from the cylinder?

Answer. It is almost precisely the same as that which is effected by increasing or diminishing the throw of the eccentric, which was explained in the answer to Question 51. In order to show this effect more clearly, we have represented by motion-curves, fig. 123, the movement imparted to the valve by the link when it is in full, half and mid-gear, as illustrated in the preceding figures. The curve for full stroke is engraved in full, heavy lines; that for half-gear in lighter lines, and for mid-gear in dotted lines. It is of course possible to work



engine will then run forward, but when the rocker-pin is below the centre of the link, its motion will be influenced more by the back eccentric-rod, and the engine will then run backward.

The motion of the link, which is somewhat complex and difficult to understand clearly, will perhaps be understood better if we represent it in a number of successive positions of the whole stroke of the piston, as was done to show the motion of the eccentric in figs. 11 to 24. We will therefore suppose that the link is in what is called *full gear forward*, as shown in fig. 103. In fig. 108 the link is in the position it would occupy at the beginning of the stroke of the piston; in fig. 109 the piston has moved four inches, in fig. 110 eight inches, in fig. 111 twelve, and in figs. 112, 113 and 114 sixteen, twenty and twenty-four inches. Fig. 114 to 119 represent the successive positions of the link during the return stroke. In order to show the different positions of the link we will represent on a larger scale in our engraving, fig. 120, the successive positions of the centre line of the link, which will indicate the motion imparted by it to the rocker. In order to designate each of these positions, the centre lines in fig. 120 are numbered + and - 0, 4, 8, etc., etc., to correspond with similar numbers in figs. 103 to 119. It will be seen that when the link is in the position shown, it imparts the full stroke of the eccentrics to the rocker-pin and consequently to the valve. We will now suppose that the link is raised up as shown in fig. 106 so that the position of the rocker-pin is just halfway between the end of the eccentric-rod and the centre of the link. This position is called *half-gear*. In fig. 121 the different positions of the centre line of the link and of the rocker have been laid out for half-gear in the same way as was done for full-gear before. From this it will be seen that the travel imparted to the rocker-pin and valve by the link when it is in the position shown, instead of being 5 in., is only 3½ in. In fig. 107 the link is raised up, so that the rocker-pin is in the centre of it or midway between the eccentrics. This position is called *mid-gear*. The successive positions of the centre line of the link in this position have been laid down in fig. 122 in the same way as was done for full and half-gear. The movement of the rocker, it will be seen, is, for mid-gear, only 2½ in. These diagrams show that when the rocker-pin is opposite the eccentric-rod, the valve receives the full throw of the eccentric, and that the motion imparted by the eccentric diminishes as the rocker-pin approaches the centre of the link, so that, with eccentrics having 5 in. throw and a valve with ½ lap and ¼ in. lead, we can increase or diminish the travel of the valve from 2½ to 5 in. by simply raising or lowering the link, which is done by the reverse-lever.



the link in any intermediate position between those which we have represented. Usually the reverse-lever is arranged so that the steam will be cut off at 6, 8, 10, 12, 15, 18 and 20 inches of the stroke.

QUESTION 185. What is the greatest and the least admission of steam possible with the ordinary link-motion?

Answer. With 24 in. stroke of piston and 5 in. travel and ¼ in. lap, steam can be admitted as shown by the motion-curves during 21 in. or 87½ per cent. of the stroke, and can be cut off at about 4 in. or 16½ per cent. It will be seen, however, that in mid-gear the motion-curve becomes a straight line, and that the pre-admission of steam, that is the admission of steam before the piston reaches the end of the stroke, is equal to that admitted after, so that it is impossible to work the locomotive with the link in that position. Practically it is found that no useful work can be done with a link if the steam is cut off at less than six inches, or one-fourth of the stroke. Even then the opening of the steam-ports is so small that the steam which enters the cylinders is very much wire-drawn.

‡ The nature of these curves was explained in answer to Question 43.

Contributions.

Narrow Gauge in California.

TO THE EDITOR OF THE RAILROAD GAZETTE:

During the last two or three years California has teemed with narrow-gauge projects. Especially has this been the case since the impairment of our national credit in Europe and the hostile result of recent State elections, which have together driven the Central Pacific into a condition of hibernation. In the earlier stages of the narrow-gauge excitement this species of railroad was contemplated as a supplement to the one great system of this State; but later it came to be regarded, in so far as it was practicable at all, as a competing plexus, and demagogues would fain have erected it into an instrument of vengeance and subversion. Being a layman in railroad matters, I do not presume to offer any opinion as to the relative merits of the two gauges. But this I will say, that California undoubtedly needs competition, that there is an opening for some system as a rival to the existing one, that there is even a yawning void to be filled, and if the narrow gauge cannot fill it (as it does not now promise to do) the presumption would seem to be against it as a practical engine of commerce. California with only one great railroad is as incomplete as a man without a wife (not intimating by any means that a man and his wife usually act in competition, but simply meaning to say that, while the huge "existing system" might suffice to transport the greater bulks, the through freight, we sorely need another, in the words of the song, to "do up the finer work"). While the Central Pacific and its branches strike like great arteries through California, we require an extensive network

of local feeders or local rivals to meet our needs. This idea has rooted itself deeply and widely in the minds of the people, and in consequence of it there sprang up an almost innumerable crop of narrow-gauge enterprises, which have seemed to choke each other out like grain sown too thick. But in justice to them it ought to be said, on the other hand, that unless any given scheme is of such limited proportions that one man, or at most a half-dozen men, can push it through to success, it stands a very slim chance of ever coming to anything in California. There is so much selfishness, so much counter-pulling and hauling, so much bitter skepticism of the attempts of others or of any public undertaking, in this land of independent, self-made men, accustomed to grapple everything single-handed, that collective enterprises are very likely to fall asunder and come to naught.

The pioneer of narrow-gauge railroads in this State is Major W. S. Watson, a civil engineer of high repute. Some two years ago, when the country began to be embittered against the Central Pacific, he commenced discussing the matter in a Sacramento journal, and the result was finally that he offered to run a survey for the first line,

THE CALIFORNIA CENTRAL NARROW GAUGE,
from Benicia to Red Bluff. This line is 168 miles long, with an average grade of less than two feet per mile, with 95 per cent. of it tangent, and no curvature in the remaining 5 per cent. of a less radius than 2,680 feet. There would have been required only 6,062 feet of bridging, 15 feet high, of trestles on piling, except the bridge over the Sacramento at Jacinto, 400 feet long in 23 feet of water. The general location of the road was from Benicia to Suisun, thence to Sacramento on one tangent, striking the west bank of the Sacramento River, this being the base or main line. Five miles from Dixon a branch leaves the base line, crosses the Sacramento at Jacinto, and proceeds to Chico, while another line passes up the right bank to Red Bluff.

Of the country traversed, 95 by 20 miles, or 1,900 square miles, making 1,216,000 acres, is capable when developed of yielding 25 bushels of grain per acre, or 30,000,000 bushels per year, equal to 912,000 tons of freight. Some of the land to-day yields 50 bushels, and an average of one great ranch traversed was 37½ bushels.

On the 1st of May, 1873, ground was broken at Benicia. In order to induce the farmers generally to take stock, the company contracted to transport their produce for five years after the completion of the road at 2½ cents a mile per ton. Ex-United States Senator Cornelius Cole (a name not a tower of strength) was the President; M. D. Townsend, Vice-President; W. S. Watson, Chief Engineer, etc. There was some trouble about the terminus, owing to the opposition of the Central Pacific, but the citizens of Benicia compensated the company by a gift of 200 acres. Several hundred Chinamen were set to work grading, and everything went well, to all outside appearance, until last August, when one night a gang of railroad roughs, "hoodlums" and shoulder-hitters fell upon the Chinese camp and scattered them so completely that in the morning not one could be found. Some had fled for miles. This attack doubtless originated from the lower purities of the Central Pacific, though it would be unjust to hold the higher officers responsible for it.

About the 1st of last December work was suspended, and has not been since resumed. This event surprised very few people who had any glimpse into the inside workings of the enterprise. Even the Benicia people, who had subscribed so liberally and hurried so jubilantly over the first shoveful of earth lifted, failed to respond when called on for their subscriptions. There never was any backbone in the business. Mr. Cole was a respectable figure-head in the Senate Chamber in Washington, but he could not turn over much money. Neither could any other member of the company. The Directors met in Sacramento, paid the debts contracted, and made the best possible adjustment of the corporate finances.

THE NORTH PACIFIC COAST RAILROAD COMPANY
was organized in December, 1871, but I believe this can be counted as a narrow-gauge scheme only since about the beginning of 1873. Starting from Sausalito (just across the bay from San Francisco), where the company have a commodious wharf, machine-shops and round-houses, it crosses Richardson's Bay by a bridge 4,000 feet long (now completed), touches San Rafael, the county seat of Marin County, thence to Tournales, then through Valley Ford and Freestone to Russian River, and down that river, crossing it four miles above the mouth, and so on through Sonoma County to the mouth of Gualala Creek. It is intended to be continued up the coast eventually to Humboldt Bay. A subsidy of \$160,000 was voted to it by little Marin County, and \$1,500,000 of the bonds have been sold in Frankfurt. It will cost, it is estimated, \$19,000 a mile—115 miles long.

This road gives promise of being carried to completion, and this is the better assured because it virtually has San Francisco for a terminus, and is a metropolitan enterprise, whereas the Benicia road was looked at rather askance by the San Franciscans. The company announce that they have enough rails on hand or on the way to iron the road. In addition to completing a bridge nearly three-fourths of a mile long, they have lately finished a tunnel over 1,600 feet long, near San Rafael. There are 1,600 men at work on it.

And this line has a very good *raison d'être*. In the first place, there is no really good and safe seaport between San Francisco and Puget Sound, and all the large coasting trade is performed at great hazard and expense, especially during five months of the rainy season. For instance, the freight on lumber from Humboldt Bay to the city is \$6 per M. The railroad will quickly take up all this, and do it 35½ per cent. cheaper. The large steamers in the Oregon trade can stop at only two places in this State, hence they lose much passenger traffic that will at once seek this railroad.

Marin and Sonoma counties are almost a solid mosaic of large and wealthy dairies, and from them a night milk train will run into the metropolis, the cars being ferried over on

boats. This will also be done with the lumber trains. Along the San Geronimo, a rapid and unfailing stream, affording the only water-power within 100 miles of San Francisco, there will undoubtedly spring up extensive manufactories as soon as the railroad is laid along its bank. For 25 or 30 miles the road will pierce the great redwood region of the coast, where the blasting and digging up of the mighty stumps for the road-bed will be an herculean undertaking. But the redwood belt is the lumber resource of one-half of the State, and the traffic in this commodity will be very heavy for years. While drought in the interior of the State has often blighted the crops, in this coast region the ocean fogs secure them, and for twenty years there has never been a failure.

SAN JOAQUIN NARROW GAUGE.

The city of Stockton has been very unfortunate in its attempts to get independent railroad communication established. Some while ago a liberal subsidy was voted to the Stockton & Visalia Railroad Company (broad gauge), but they failed to comply with the terms, and the line passed into the hands of the Central Pacific, who made Lathrop the starting point instead of Stockton. Then the Stockton & Copperopolis road was commenced, and built across the plains to the edge of the foothills, where it came to an inglorious termination in that wretched, desert, sunburnt no-place, Milton. Lastly the above-mentioned narrow-gauge scheme was projected. Two lines were surveyed between Stockton and Visalia, one near the foothills, the other keeping nearer the San Joaquin River. The length of the latter is 164 miles; greatest height above tide, 373 feet; maximum grade ascending south, 47½ feet; average grade, 11 feet; total length of bridges, 23,582 feet; total estimated cost, \$1,877,448.53; average cost per mile, \$11,447.85. The capital stock of the company was fixed at \$500,000, some \$200,000 of this was subscribed, and 10 per cent. was paid in. The usual "great enthusiasm" prevailed, large numbers announced their willingness to do grading, furnishing teams, etc., taking stock in payment. The hiring of Chinese was strongly opposed, and well it might be, for the great San Joaquin Valley, unirrigated, was then so dry that farmers were anxious to work on the road to earn a little money to buy bread and seed-grain.

A correspondent gives this wonderful account of the demise of all these hopes: "After the most enterprising men and farmers in the vicinity of Porterville had paid in 10 per cent. on stock, to the amount of \$15,000, because some who owned large tracts of land and would receive the most benefit would not subscribe, the whole affair was thrown by; for it did not seem fair that the rich should be benefited by the efforts of the comparatively poor." The old story in California. The rich here referred to are the great cattle lords who don't want any railroads, lest they should scare their cows and bring in "the damned farmers" to break up their great cattle-ranges.

SAN MATEO & SANTA CRUZ.

For a hundred miles immediately along the coast south of San Francisco there is a fine and wealthy region, especially adapted to the production of vegetables and dairy articles. Two companies were organized, one to build the line in Santa Cruz County from Watsonville (where it connects with the Southern Pacific) north to the county line; and the other to build it in the two counties of San Mateo and San Francisco. The last-named company comprised some very wealthy capitalists of the metropolis, among them Alvinza Haywood, worth probably \$30,000,000; but it seems to be doing nothing, at least nothing is heard from it. Santa Cruz County voted a subsidy of \$6,000 a mile for 42 miles, making \$252,000. This end of the road is being prosecuted with vigor; all winter the work has gone on despite the heaviest rains. The construction began at the town of Santa Cruz, and is being carried southward toward Watsonville, which will, it is thought, be reached before the end of this year.

ALAMEDA, OAKLAND & PIEDMONT.

This road is a narrow-gauge, and runs cars capable of seating about twenty-five passengers. Starting from Oakland, it runs through the most densely populated and highly cultivated portion of Alameda County, to Piedmont Hotel, a watering place on the Coast Range, 400 feet above the sea, whence it is contemplated to continue it on over into Contra Costa County, to an entire length of 60 miles. The capital stock amounts to \$100,000, all paid up.

STOCKTON & IONE.

About a year ago a company was incorporated to construct a line 38 miles long, from Stockton to Ione City, in the valley of the same name, situated in the foothills of the Sierra. Capital stock \$500,000. The road was estimated to cost about \$8,000 a mile. This fine valley has been settled up for twenty years, and it is not subject to the droughts which frequently devastate California. In addition to that, there have been discovered a number of coal mines in the foothills of Amador County, and if their product can be cheaply transported to Stockton, it will give an impetus to the manufactories now springing up in that city in considerable numbers. A contract to construct the road was given to A. B. Platt, a wealthy contractor, and a few miles were constructed, but of late the company make no sign. There seems to be a fatality attending all roads projected in Stockton.

TRUCKEE LUMBER COMPANY.

There is a 3½-foot gauge road running from a chute on the Truckee River at Comer Fishery, six miles from the town of Truckee, back into the great timber belt of the Sierra Nevada. It is a line which will be extended continually into the forest, according to convenience, as fast as the timber is felled. The rails weigh 20 pounds to the yard, 70,000 pounds to the mile, and cost \$120 a ton, \$4,300 a mile.

MISCELLANEOUS.

Besides the above, there have been projected the Truckee & Plumas, the Los Angeles & Santa Monica, the Martinez, the Colfax & Nevada City, the Feather River, the Dixon & Maine Prairie, the Wheatland & Nevada City, the San Luis Obispo & Santa Maria (of which a few miles have already been constructed), the San Jose & Aliso, and heart knows how many

more. All of these have reached various stages of incubation, but only one of them has picked the shell. The Colfax & Nevada City may be built; Grass Valley and Nevada City have carried their subscriptions to about \$115,000 apiece, according to the last accounts, and there is "immense enthusiasm," though this latter is rather an augury of failure than otherwise, as things have gone heretofore. We did hear that a Colonel somebody had sold \$100,000 worth of sheep to raise funds to build the Los Angeles & Santa Monica line (about 20 miles long, running from Los Angeles to the coast, where there is a famous watering-place), but nothing has been heard since. All the others appear to be hopelessly dead.

STEPHEN POWERS.

The Galveston, Harrisburg & San Antonio Railway.

HOUSTON, TEXAS, April 20, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Galveston, Harrisburg & San Antonio Railway is to-day opened to Flatonia, Fayette County, 12½ miles west of Schulenburg, its terminus for some months past, and 164 miles from Galveston. While all other railroad enterprises in Texas languish, the construction of this road is being actively prosecuted through the energetic and skillful management of Mr. Thomas W. Peirce, of Boston, its President and proprietor, whose firm faith in the great future of Southwestern Texas induces him to spend his wealth in building a first-class road to San Antonio, once the great emporium of the trade of the adjacent Mexican States. The grading is almost finished to the San Marcos, 36 miles west of Flatonia, and 52 miles from San Antonio. The fact that this line of road crosses the numerous rapid streams and rivers flowing southward to the Gulf of Mexico necessitates the construction of a large number of truss bridges in spans varying from 88 to 280 feet. These structures, part wood but chiefly iron, are of the plan known as the "Post combination," and so far have been furnished by the American Bridge Company of Chicago. As tracklaying progresses, large quantities of yellow pine from Louisiana and Eastern Texas daily go forward to the "front" to supply the demands for pile and trestle bridging, depots, stock-yards, section-houses and the various etceteras of railway construction. Good building stone is scarce till the San Marcos is reached. As the track is laid it is well ballasted and put in thorough running order.

The Superintendent, Mr. Lawrence Kellett, who is also Superintendent of Construction, and Major J. Converse, the Chief Engineer, inform me that all arrangements are made to complete the road to the San Marcos River by the 1st of July and to San Antonio by the 1st of December next.

As most of your readers probably know little of this road, or the country through which it passes, perhaps I may add a few words relative to it.

At Harrisburg, on Buffalo Bayou, a deep, sluggish stream which flows into Galveston Bay, this road leaves the Galveston, Houston & Henderson Railroad, and at Junction, 8 miles distant, intersects the Houston & Great Northern Railroad, now completed to Columbia, on the Brazos, 49 miles southwest of Houston. At Richmond, 24 miles further, it crosses the Brazos by a substantial bridge erected by the Louisville Bridge Company. It is of the pattern called the triangular combination, the lower chords being iron. The centre span is 260 feet in clear. At Columbus, 83 miles from Harrisburg, the road crosses the Colorado, here 350 feet wide, by a Howe truss bridge, now being replaced by a "Post combination." Eight miles farther the road reaches Borden, where the late Gal Borden, a man distinguished for energy in benevolent enterprises as well as in business, spent above seventy thousand dollars on a factory, whence the best beef produced in Texas is sent forth to the world in various preparations. Thus far the road passes through a flat, uninteresting country, moderately fertile, except the river bottoms, which no soil in Texas exceeds in richness. They are usually occupied by timber, except where the settler has cleared his plantation. From Borden westward the country rises and presents a most lovely appearance, diversified by hill and valley, prairie and timber. The soil, a black, sandy loam, is rich; over the hills and prairies are scattered evergreen oaks, very many of which are of large size and rare beauty. This character of country extends to the Guadalupe, beyond which timber becomes scarce. In my travels through many States and Territories between the Great Lakes and the Gulf of Mexico, I have passed through districts possessed to varied attractions, but nowhere have I seen a country excelling this from Borden to the Guadalupe in beauty, healthfulness and fertility.

West of the Guadalupe and Upper Colorado rich pastures extend to the Rio Grande. These sustain immense herds of the best cattle in Texas. To ship these at low rates to St. Louis, Illinois and farther east preparations on an extensive scale are being made by the railroad companies interested. These cattle will pass over the Galveston, Harrisburg & San Antonio Railway to Junction, thence by the Houston & Great Northern, Cairo & Fulton and Iron Mountain railroads and their connections to several points on the Mississippi, thus opening a much-needed market to the cattle trade of Southwestern Texas.

P. L. I.

The International and the Victoria Bridges.

MONTREAL, April 30, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The controversy on American and English bridges in your paper of the 4th of April, and extending to subsequent issues, dealing with structures I am interested in, I must be allowed to correct certain statements.

As the Chief Engineer of the International Bridge, I would mention, I had peculiar reasons for adopting the Pratt truss made at Phoenixville.

As the Chief Engineer of the Grand Trunk Railway of Canada, and having been associated with this railway during the building of the Victoria Bridge, I may be allowed to state

that the letter of Mr. W. W. Evans, under date of the 17th of October, 1872, so far as it refers to this bridge, is incorrect.

You say you believe your issue of the 11th of April was the first publication of this letter; it is certainly the first I have seen, and I am sorry to find one of my own profession making a statement on the Victoria Bridge, upon which, if he had referred to me, as the engineer in charge, I would have set him right.

Mr. Charles Bender, in his article copied in your paper, refers to the Victoria Bridge as losing its rivets by "pails filled with them."

The statements made by these gentlemen on the Victoria Bridge are not correct, and are the opposite of the facts, and it is exceedingly painful to me to have to correct them in print, when it would have been much more pleasant to have made it direct, if I had been afforded the opportunity; and the absence of these incorrect statements would have given more weight to the other portions of their papers, which our friends across the Atlantic may now reasonably question.

E. P. HANNAFORD.

Electric Railroad Signaling.

[A Paper read before the Engineers' Club of St. Louis, February 4, 1874, by Charles A. Smith, C. E.]

Very early in the life of railways the aid of that subtle agent electricity was invoked to outstrip the speed of the locomotive, to transmit orders and information about the movements of trains.

The amount and importance of the service thus rendered varies greatly with the various local conditions imposed, and it is my object to discuss briefly a few of these variations.

The principal difference in the use of the telegraph on the different sides of the Atlantic has been, that in the United States the Morse instrument has been almost universally employed, while in England, until quite recently, the needle instruments of Cooke and Wheatstone were alone used, while in France Breguets' dial, and in Germany that of Kramer, have been extensively employed.

This difference of instruments was, as we shall see hereafter, one of the prime causes of the difference of practice; and the other is the magnitude of the traffic to be controlled, which of course governs the amount of money which can be obtained for any system of control.

In this country lack of funds has been the principal feature of most of our railroad companies, while across the water money has been lavishly used for all purposes connected with the safety as well as the construction and equipment of the line.

In England most of the early lines were built for a double track, and when a single track became in any way crowded, a second was at once added. In this country, on the contrary, the telegraph was called into play at an early stage, the rapidity of the Morse sounder rendering possible a very large accession to the ordinary service of a single wire. The telegraph companies furnished the operators at the important stations, and forwarded the messages of the railway business as an equivalent for the facilities of erection, inspection and repair given them by the railways. As the railway traffic increased a separate wire was devoted to their use, which the telegraph companies paid for and kept in repair. Various contracts of course have been made between the different parties. With this usage developed the system of "train-dispatching," by which one man from a principal office governs and is responsible for the movements of trains on his division, making no use of his power until after the schedule becomes inoperative. Thus the ordinary rules become supplemented by the strong hand of authority, just at the moment when a longer adherence to the schedule would delay the business of the road and endanger the safety of other trains than those in question.

In England, on the other hand, the common telegraph instrument of the day did not admit of the speed of the Morse "Sounder," and as the principal use was on double-track roads, where, of course, the object was to keep a following train from overtaking a preceding one, the system naturally adopted was of asking from station to station if the track was clear; that is, if the preceding trains had all arrived at the next station. This, of course, soon required a separate wire, as did the American system also, but with this difference, that in the latter the wire is uninterrupted, passing through all the instruments and running to a primary office, and on which only one message at a time can be sent, while in the other the wires are discontinuous, running from station to station, requiring double the number of instruments, and giving the use of each portion of the wire for a message at the same time, if necessary.

One other most important difference must be clearly understood, and that is one of principle as well as of practice. With the American system, on a double-track road, an accident is always possible, which may give rise to a "tail collision." A train breaks down between stations and a following train runs into it. This may occur in many ways, and does occur a good many times in the course of a year, as a reference to the lists of accidents in the RAILROAD GAZETTE will show very clearly. With the American system the work thrown upon the wires and operators is very unequal in amount and importance. The daily records go on from one week to another, and all goes well. Then comes the winter, and all the trains on the line are late, and the work thrown on the dispatcher is, all at once, of immense importance. Perhaps, at this juncture, the wire makes a bad break near the dispatcher's office. With the other system the work is the same from day to day, and a break at one place in the wire affects that portion only.

So far our view has been purely theoretical, and now let us, for a moment, see if experience agrees with us on this point. The limit of train-dispatching has never been exactly settled, although we may consider that the New York Central, which is now laying two additional tracks, has fully decided that its

business has grown too large for its existing double track. I do not know the maximum number of trains in both directions over this road, but have been informed that two hundred a day would be a large estimate; hence we may say that two hundred trains a day is near the limit in this country, especially where the lines are troubled with snow. In regions further South a greater number can be safely managed.

With the other system, by shortening the distance between the stations, any number of trains can be accommodated, till the limit is reached, when the distance between stations becomes so short that a train at high speed cannot be stopped in it, and this of course necessitates the erection of telegraph stations at points between the railway stations; and as it is usually not desirable to stop trains at these intermediate points, conspicuous signals for the trainmen are established in connection with these stations. The distance between these stations is governed, of course, by the number of trains and the closeness with which they are expected to follow each other. At first these were the regular railway stations, and as the number of trains increased others were interpolated.

The number of daily trains managed by this system on the London & Southeastern line is stated at seven hundred on a double track, and I think few train-dispatchers in the country would be willing to assume the charge of a division of seventy miles with seven hundred trains upon it. The number in twenty-three hours upon the Metropolitan is stated by *The Engineer* at one thousand, without counting those run by the Great Northern over the Metropolitan. I think this number is carried on four tracks, however.

This brings us to the consideration of some of the details of this system. The first instruments devoted to this service were the needles or upright galvanometers of Cooke and Wheatstone, and instead of asking the necessary questions, as so many words of so many letters, a given number of movements was used; in short, an agreed signal was adopted.

Thus one movement to the right could be taken as the question, "Can up train come in?" that is, have all up trains arrived at the next up station; and a wave to the right repeated from the other station is taken as "Yes."

A movement to the left would then mean, "Can down train proceed?" and a return of this movement as an answer in the affirmative.

This was soon followed by the use of bells for the signals, dispensing with the needles—one stroke of the bell being a call of attention, two the question and three the answer for trains in one direction, and for trains in the other direction two and three double strokes. This system is used on the German railways.

The two methods just described have one radical defect: they leave no record to the eye of the signal-man; and if a record form is filled out by the operator, the chances of forgetfulness are still great. A remedy for this in the needle apparatus is the use of two wires and duplicate needles, one for the up line and the other for the down. The movement of one needle to the right is the question for one line, and the answer is the movement of the same needle to the right, which then remains over to the right until the train has reached the next station, and is then released by the operator there. On the other wire the process is of course in reverse order. This can be effected very simply by arranging the key-plate in such a manner that only the answering station can lock the sending key. This was first done with a key which was like the needles in swinging on a horizontal axis. A hole was made in the key-board in which a peg could be inserted. The key was then turned to answer the question, "Can train come in?" and then the peg was inserted and the key and needles on that wire kept over to "train in." The station behind the train had no power to alter these needles, and the wire was said to be "blocked" or "pegged" over to "train in," and the line was "blocked." From this the method of control has come to be called the "block system."

The communication from operator to train-men is made by signals mounted above the station, usually a vertical post from which two swinging arms project, one on each side. The right-hand one belongs to the right-hand track, and the left-hand one to the left-hand track. The arm in a horizontal position usually means "stop," and in an upright or upward inclination "all right." These signals are worked by levers and rods from the building below. Often in connection with this station is a pair of distant signals worked by wires, from one to four hundred yards from the station. By these a train can be stopped, even when passing at full speed, and can be signalled to stop at the station when approaching.

There are two ways of working these signals to the train-men. One is to keep the signals habitually at "all clear," and to change the position to "danger" only when the train is to be held back. The other is to keep the signals weighted at "danger," and to hold them open while a train is approaching to which the signal "all right" is to be given. The latter method is the one most suited to lines with very heavy business, although the former has some advantages.

Various apparatus have been devised for the purpose of rendering the understanding of these simple questions a matter in which no mistake in the minds of the signal men can be made, and among these varied forms we find after the bell and needle instruments a new idea: the making of the moving arms or signals of the instruments exact through miniature representations of the external signals. By this means mistakes are very much lessened. Many of these systems use three wires—one for each line and one for the bells which are used to call attention to the instruments.

The expense of any such complete system, with intermediates, will be long thought a drawback to their use in this country, but it must not be forgotten that the chief item is the wages of attendants; but to some of the roads this would not be such a great increase of cost, where flagmen at every mile are employed at present, and of course would come upon the larger companies as those who need the intermediate stations most.

In order to reduce this question of expense, many attempts have been made to render the signals automatic, and there are several roads using them in this country. The most complete system that has come under my notice is that on the Eastern Railroad, where some sixteen miles or so have been on trial for the last year. Their apparatus is a double-line block with the signals standing at "all right" until, by the passage of an engine, it is thrown over to "danger," and so remains till the engine passes over the end of the section (one mile distant). In order that the driver shall know whether he is protected by the signal in his rear, a "tell-tale" is put up some two or three hundred yards ahead, which usually stands at "danger," but which is governed by the section signal, and, as that moves to "danger" behind the engine, goes over to "all right" ahead of it. This has hardly been in operation long enough to give any great value to any expression of opinion, but it has proved troublesome in winter, and the last summer regulations and time card contained no notice of it.

The chief advantages of an automatic system, of course, are certainty of transmission and freedom from human weakness; but in the road to this desideratum there are many practical difficulties. Imperfect connections and deficient insulation are among the most apparent, and as long as these exist we would feel justified in saying that we are safer without them. We will now consider the questions arising from working a single-track road.

With a single track the questions are simplified to asking from either end, "Can train come in?" and receiving from the other end of a section the answer "yes" or "no." As these questions are symmetrical from either end, they can be carried on a single wire, and either the needle, bell, or other instruments may be used. A lock or catch can be placed upon the sending keys in such a manner as to give "danger" at the other end of the line, and they can only be held at "line clear" while the operator holds it himself. In any case bells must be used to call attention. Or the signals may rest at "all right" and require the operation of both signal men to put them to "danger" and release them again. This latter serves to answer the questions very easily, but the apparatus is more complex than the former system demands. To sum up, then, a simple single line "block-system" can be used which can easily be understood and operated by men of ordinary capacity, and can generally be used from station to station with only here and there an additional signal station interpolated, according to the distances and numbers of the trains on the line. This may be placed in the offices where telegraph operators are also employed, and may be under the care of the station-master at smaller stations, at crossing flagmen's boxes, or at any switch-box. The additional cost would be slight. At some places the skilled telegraph operators could be dispensed with; at some places night-men or the station watchman would be of service. At many places the night service could be dispensed with, or take place only at certain hours for slight increase of compensation. Thus would the block system become a valuable adjunct to "train-dispatching" and the time-card, making wild trains far safer, and enabling a traffic to be reached on a single track far greater than can now be managed.

A remark here on the kind of signal used to communicate information to trains in motion will not be out of place. The use of colors is most commonly made the basis of such signals, and at night colored lights are universally employed. For the day signals the use of target boards with two colors is much better than when the target is all of one color. The strongest contrast is between black and white, not red and white. Red makes a stronger contrast with external objects than any other color. One of the best switch signals on this system shows white on a black ground for trains in one direction and black on a white ground for trains in the other direction when set on the main track. The movable centre shows the target all of one color when the switch is off the main line.

The use of colors is open to several objections. The brilliancy and permanency of the contrasts are hard to preserve in bad weather; but more especially in peculiar lights and certain positions of the sun it is almost impossible to distinguish the symbols. A case in point occurred recently at a crossing where two trains tried to cross at the same time, and where both of the engine drivers swore to having the target in their favor; and as they were at a full stop within 500 feet of the signal, the question was only settled by referring to the signal man, and it was then discovered by the officers of the road, that at the given time in the afternoon no man could tell how the signal was set, although it had been in use about a year before this accident happened.

Cases of color blindness are by no means uncommon, and one was found in an engine driver who had run for ten years.

A much better system is based on the change of form which the target undergoes when viewed from a distance. A change from a rectangular board to a disc, for instance, or from one position of an arm to another. The "all right" signal should always be a positive signal, not the mere absence of that to stop; in the latter case a man might pass such a signal for months without being halted by it, and become careless in consequence. Viewed in all lights, the semaphore arm projecting from the side of a vertical post seems to be the best for use in the daytime.

At night there is one great objection to the use of colored lights in the diminished brilliancy of any but white lights. Red is less objectionable than any other color; blue and green cannot be seen very far, and red only about half as far as white. For a night signal the semaphore arm with two or more white lights on it; for a double-track two arms, one on each side of the post, with three white lights on it, one on the post and one at the end of each arm, indicating by their relative positions the position of the arms, would be the best for a distant signal for fast trains.

A very primitive signal is a mast with one or more balls at the mast-head, with lights attached at night. This is extensively used in New England, but it must cost more than the semaphore arm, and requires more time to set or change position.



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Editorial Announcements.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

PRACTICAL KNOWLEDGE.

In operating railroads the ultimate end aimed at is to do the work with as little cost as possible. Of course economy is not the only object to be kept in mind. Passengers should be carried safely and comfortably, and freight delivered promptly and expeditiously, but the expense of doing this must be reduced to the lowest possible figures. The kind of knowledge, therefore, which is sought most, and is in greatest request among those who have charge of the operating departments of railroads, is that which will enable them to have a given amount of service performed at the least cost; and this kind of knowledge, by common consent, we call *practical knowledge*. We will not discuss, at present, that other question of moral responsibility which is laid upon all of us in giving and receiving, in buying and selling and on employer and employed. If corporations had souls, a sermon to them on their duties in such relations might be profitable, but as railroad companies are not supposed to be immortal, the only future they anticipate is future dividends, and the only damnation they know is bankruptcy. Of course we refer to corporations and not to individuals. We believe and know there are many—more than is currently believed—high-minded, just and conscientious railroad officers, who would carry out their convictions much more fully than they do if the requisite authority were given them.

The practical knowledge referred to is that which is measured by the common standard of dollars and cents. Considering that its value is estimated by this universal measure, it is a little singular that there should be so much difference of opinion with reference to the qualifications which are necessary to direct the operation of railroads with the greatest economy. People very rarely regard any of their own knowledge as useless and very seldom distrust their own opinions, although it is doubtless true that persons sometimes overestimate the value of knowledge of which they are ignorant.

Illustrations of the truth of the first proposition are not hard to find among all classes of railroad employees. A track-layer is apt to regard all men as incorrigible asses who do not know how to lay out the position for a switch or a frog, or who cannot get the proper angle for a crossing. Men who began their railroad career as firemen, and who finished their education by running a locomotive, are apt

to hold in contempt anyone who makes any pretence to engineering knowledge who would not know what to do if a locomotive worked water, or who "lost" his fire while running a heavy express train, or could not get his engine home if one of the eccentrics slipped. A machinist is apt to think a person utterly unfit to hold a position of responsibility if he cannot set a pair of guide rods true or "run a big lathe." A train-dispatcher assumes that the most essential qualification in railroad management is to know how to move trains and keep them out of each other's way. We remember a man who was employed at a certain large railroad shop to ring the bell which called the men to and dismissed them from work. This duty of his he regarded as of immense importance, and his contortions and posturing while pulling the bell-rope were extremely amusing. It was Dickens, we believe, who related that he met a man in this country whose sole claim to distinction, on which he prided himself very much, was that his father was the first man who introduced "cold-pressed castor oil."

Perhaps no class of men overestimate the value of their own knowledge and underestimate that of others so much as the students and graduates of technical schools and colleges. Many of them seem to think that all the problems of life are soluble by what practical men call the $x+y$ process, and it is only by the hard knocks of practical experience that these learn how much and how little value mathematics and pure science have in conducting the affairs of life. On the other hand, practical men are very apt to disregard, or rather not apprehend, the fact that other men have been and are still engaged in the same occupations that they are, and are gaining experience and knowledge which is quite as valuable as theirs. There is a certain kind of dense obtuseness to which practical men are prone, which, if not counteracted by reading or some other method of gaining knowledge, becomes one of the most hopeless of mental conditions. The authority entrusted to most railroad officers insures a certain amount of deference to them, and makes them objects of flattery and exposes them to all the arts which skillful salesmen know so well how to use to secure orders and the good will of those with whom they do business; until finally, inclosed within their own narrow sphere, if they do not go beyond it either by reading or by meeting people who are wiser than they, it is very apt to lead to an inflated condition of hopeless vanity and conceit. One of the greatest preventives of this state of mind, and the one that is within the reach of all, is the companionship of books. On the other hand, books alone breed a disease almost as bad as that we have described. The young student, with his honors fresh upon him, is apt to think that all knowledge is to be found in the books, and that the man who can calculate the theoretical strains on a bridge is a competent bridge engineer. Alas, how such fond dreams and airy bridges are sometimes crushed! Most of us who have studied in the practical school of a machine shop know what objects of ridicule and subjects of practical jokes the nice young men are who come there to exercise their science and learn their ignorance, which latter they are quite sure to do if they stay long enough; and it is generally the most valuable acquisition which such persons can gain. If we regard the deficiencies of both classes, it will, or should be, great cause of regret that the two kinds of knowledge cannot be more assimilated—that is, that one class, who know books, do not get the practical knowledge, and that those who have the latter do not add to it the information to be found in books, and, what is perhaps more important, the mental discipline which study gives.

We will try and illustrate how it is that this separation of practical and theoretical knowledge often works evil. We will take the case of a young man fresh from a technical school, who knows mathematics, who has studied mechanical drawing, and is well up in Rankine's books and the science of thermodynamics. We will imagine him set at work to make the drawings for a locomotive. He has learned, doubtless, that a large grate is necessary in order to produce good combustion of coal, and therefore, finding that there is room enough between the axles, he lengthens the fire-box, but unfortunately does not leave room enough for the eccentrics to turn in front of it. He has also learned that the centre of gravity of locomotives should be kept as low as possible, and he therefore lowers the boiler six inches, thus making it impossible to get in the springs over the driving box; and as the rocker-pin is placed in the centre line of the axle, the link or link-hanger strikes the boiler, making it impossible to work the valves in full-gear backward. Knowing as he does that the nearer the truck axles are placed to each other the more they will approximate the radii of curves, he concludes to bring them six inches closer, thus making it impossible to take off the front cylinder-head without "jacking up" the front end of the engine; and as the driving-wheels are small and the truck-wheels large, the latter strike the guides on short curves or switches. This could have been avoided simply by raising the guides above the centre line of the cylinder, and there would have been abundant

room for the link by lowering the rocker-pin three or four inches below the centre of the axles. We could fill the GAZETTE with blunders of various kinds which inexperienced persons might make and have made. One occurs to us which was amusing, showing the serious results which follow a comparatively trifling oversight.

Some years ago a locomotive was rebuilt, and in doing so it was determined that the eccentrics should be cast together in pairs. The angle which their centres should bear to each other was carefully worked out on a model, and the eccentrics turned up from centres whose position was thus determined. They were then put on the axle and the wheels pressed and keyed on and put under the engine; but, to the dismay of those concerned, it was impossible to set the valves with the eccentrics. On investigation it appeared that the person who determined the relative positions of the centres of the eccentrics had turned the crank of the model backwards. It then appeared as though nothing could be done excepting to cut the eccentrics in two with a hammer and chisel, and make new ones in two parts, or else draw off the wheels. The former was done, but no sooner was the difficult job completed than some irrepressible person suggested that they might have saved themselves the expense and trouble by simply reversing the position of the eccentric-rods, putting the lower one above and the upper one below. Now a person whose experience had been exclusively practical would be just as liable to make such a blunder as one whose knowledge was acquired from books alone. What we want to illustrate and call attention to is the fact that the work of designing locomotives is one which requires special training and experience. It is of course impossible for us to enumerate even the immense number of mistakes and errors which only a knowledge of shop details, of the use of tools and machinery, and the qualities and method of working different materials would enable a draftsman to avoid. Of the two, an apprentice, with merely an elementary knowledge of mathematics, if he has had a few years' experience in the shop, has information which would be much more valuable for a draftsman in designing railroad machinery than all the science which a graduate of any of our polytechnic schools might have. There is this difference, however, that the graduate of the school, supposing his natural qualifications to be the same, would have a mental training which would enable him to learn much faster and acquire knowledge much more accurately than an uneducated apprentice. We have, of course, selected a draftsman merely as an illustration of the principle we are considering. What we want to insist upon is, that knowledge which is in the largest sense practical is the clear apprehensions of facts by a mind disciplined to think logically. The clear perception of facts is impossible by reading or thinking about them, and every engineer knows how much more distinct an image can be produced in the mind by a drawing of a machine or structure than by a description only, and how immeasurably more vivid is the mental impression left in the mind by seeing and handling a machine than it is possible to produce by the most accurate drawings. To quote from an address by Prof. Huxley on Universities: "Even in such a simple matter as the mere comprehension of form, ask the most practiced and widely-informed anatomist what is the difference between his knowledge of a structure which he has read about and his knowledge of the same structure when he has seen it for himself, and he will tell you that the two things are not comparable—the difference is infinite."

When, therefore, those who conduct our technical schools propose to supply young men who are competent to take charge of work without other experience than that which their studies has given them, they are, we think, making a grievous mistake and doing an injustice to the employer and the employed, and it is because such pretensions to knowledge are so often made and have so little ground that there is so much distrust of the value of what is called theory, but which, if properly used, is of the highest practical value.

There is, however, another view of this question which should be presented. There is, perhaps, nothing which indicates so soon and so certainly the difference between a well disciplined mind—one accustomed to thinking clearly and accurately—and one which is not, as the distinction which people make between their knowledge and ignorance. It is hardly necessary to attempt to analyze how it is that education and study enable and in fact oblige students to do this; how it cultivates habits of classification and of generalization; how it gives the capacity and insight which enable people to draw sound deductions and apprehend the force of reasoning—gives, in fact, what is called the scientific method of deducing truth from multitudes of facts. It would of course be as absurd to say that only educated people can reason correctly as it would be to assert that only he who is acquainted with the anatomy of the arm could strike a hard blow. What can be said truthfully, we believe, is, that education gives a capacity for collecting information and reasoning logically therefrom, and that reading furnishes the means of learning much of what has been accomplished by others and thus often prevents us from traveling over the same ground

Leaving for the stock—6.1 per cent.....	\$3,033 350 15
Paid dividend August 1, 4 per cent.....	1,978,040 00
	\$1,035,310 15

Gross earnings—1870.....	\$13,500,235 53
Gross earnings—1871.....	14,906,280 89
Gross earnings—1872.....	17,699,935 28
Gross earnings—1873.....	19,414,509 26

These earnings include the entire amount of the earnings of the Jamestown & Franklin Railroad, instead of our 60 per cent., as heretofore stated; 40 per cent. is afterward deducted as rental of that road. This corrected basis of comparison is adopted in all the statistics given in this report.

Increase in gross earnings, 1872 over 1873, \$1,714,673.98, which is 9½ per cent.

Of this increase \$1,367,536.57 is from freight, an increase of 10.7 per cent., and \$351,136.45 from passengers, 8½ per cent. Earnings from other sources show a decrease of \$4,049.04.

The average rate per ton per mile on east-bound freight (which is 73 per cent. of our entire freight movement) was 1.297 cents in 1873, against 1.273 in 1872, a slight improvement; but the rate per ton per mile on west-bound freight (which this company cannot control) was but 1.437 cents in 1873, against 1.638 in 1872—a reduction of .201 of one cent—equal to 10 per cent. on the entire movement of freight westward; resulting in a loss of net earnings of \$411,000, and accounting for 1½ of the 4 per cent. increase in operating expenses (the other 2½ per cent. is wholly in the excess of steel rail laid in 1873 over the amount put down in 1872, which will be shown under its proper head), as we were compelled to move 17 per cent. more tonnage to secure 10.7 per cent. more earnings.

We continue the record of the steady downward movement in the rate per ton per mile of the entire freight movement of this road for the past six years.

1868.....	2 45-100 cents per ton per mile.
1869.....	2 34-100 cents per ton per mile.
1870.....	1 50-100 cents per ton per mile.
1871.....	1 39-100 cents per ton per mile.
1872.....	1 37-100 cents per ton per mile.
1873.....	1 33-100 cents per ton per mile.

Had we been able to obtain even the low rate of 1870—1½ cents per ton per mile—the net earnings from freight would have been larger by \$1,739,497, and we should have earned the usual February dividend of 4 per cent., with a handsome surplus besides.

Earnings from passengers show an increase of \$351,136.45, which is 8½ per cent. This increase is derived mainly from local business.

CONSTRUCTION.

This account, in 1873, amounted to \$2,349,959.84. The following details will best explain this expenditure:

Harbor Extension of Ashland Branch, 2¼ miles.....	\$123,723 69
Second track, from Elkhart west, 6¼ miles.....	111,519 06
Additional side tracks, 79¼ miles.....	950,993 73
Stone and iron bridges.....	327,045 97
Real estate purchased.....	187,543 41
New buildings and machinery.....	553,382 19
Completion Chicago Passenger Depot (our half).....	85,732 80

Upon the death of our late President, Hon. Horace F. Clark, which occurred June 19, 1873, and the reluctant acceptance of the presidency by the present incumbent, July 1, it was deemed prudent, in view of the financial condition of the company, to stop all construction work that could be postponed without actual loss.

Hence the work of building the second track from Elkhart to Chicago—100 miles—which had just been entered upon, was stopped at Osceola, 6¼ miles west of Elkhart.

A contract for 20,000 tons of steel rail, of which about half was intended for this hundred miles, could not, however, be canceled, and we received and paid for, in 1873, about 14,000 tons of steel rail on this contract. The balance, 6,000 tons, we are taking in 1874. This rail was put down in the main track as fast as iron rails needed to be taken out, and amounted to 14½ miles—the entire cost of which has been charged to operating expenses, although the cost over iron rail amounted to \$578,909. This large excess of steel rail laid in 1873 over the amount laid in 1872 (79 miles) accounts for 2½ of the 4 per cent. increase in operating expenses.

We now have in the main track between Buffalo and Chicago 413 miles of steel rails, equal to 44 per cent. of both tracks. Of the road between Buffalo and Cleveland, 183 miles of double track—equal to 366 miles of single track—all is steel except 88 miles of single track. On the Cleveland & Toledo Division the steel rail amounts to 43 miles, and between Toledo and Chicago 92 miles.

Experience has abundantly shown that one steel rail will last as long, at least, as ten iron rails laid opposite to it; hence the policy of renewing track with steel, where the traffic is heavy, needs no defence. Under the present low rates of transportation no trunk line can afford to put down iron rails.

It was found necessary, to relieve the crowded narrow passage through Cleveland, where the business required the passing of twelve hundred cars per day, to purchase land outside the city for distributing yards, engine house, repair shop, etc., similar to the improvement at Air Line Junction, outside of Toledo, described in our last report. After long negotiations, our Chief Engineer secured several different tracts, aggregating 160 acres, lying in a body on both sides of our track at Collamer, seven miles east of Cleveland, at \$650 per acre. This land has been graded, several miles of tracks put down, an engine house with 21 stalls, and office, are nearly completed. Through freight trains in either direction are now run directly through Cleveland, without stopping to switch, all distributing and switching being done in this yard at Collamer. This improvement, when completed, will enable us to pass through Cleveland 50 per cent. more cars than formerly. Without it we could not have increased the business passing through Cleveland. The maximum had been reached.

The expenditure for construction in 1874 will be limited to the completion of this improvement and other unfinished work, and will be small in the aggregate.

The entire outlay for construction was:

In 1873.....	\$2,349,959.84
In 1872.....	5,504,217.99
In 1871.....	3,343,383.70
In 1870.....	1,113,560.90

Total—four years.....\$12,311,122.43

For additional equipment:

1873.....	44 Engines.....	878 Cars.....	\$1,196,503.13
1872.....	72 Engines.....	1,718 Cars.....	1,953,853.90
1871.....	47 Engines.....	1,151 Cars.....	1,301,422.50
1870.....	25 Engines.....	601 Cars.....	654,309.45

Total...188 4,298 5,106,066.98

Total outlay for construction and equipment—4 years...\$17,417,189.41

GENERAL REMARKS.

Immediately upon the acceptance of the position of President by the present incumbent, and of Managing Director on the line by Mr. Amasa Stone, Jr., a conservative and economical policy was inaugurated. Construction work to the amount of \$1,500,000, already ordered, was stopped; a reduction of pay roll, both by discharge of men and reduction of wages, as far as practicable, was carried out after the panic.

Although the balance sheet printed herewith shows an increase of about \$5,500,000 of debt in 1873, it is proper to say that but \$400,000 of this amount was incurred in the last half of the year, and that was for construction and equipment contracted for prior to July 1.

With the recent extraordinary open winter in our favor, we enter upon the spring with the road and equipment in first-

class condition, and with fair rates for even the present diminished volume of business, the percentage of operating expenses should be considerably less, and we hope to show a more favorable result in 1874 than for the past year.

When I accepted the position of President of the company, July 1, 1873, I found its financial affairs in an embarrassed condition by reason of a large floating debt which had been incurred for construction and equipment. This embarrassment was greatly increased by the panic which followed immediately.

When, therefore, the time arrived for the declaration of the usual February dividend, it was deemed sound policy and for the best interest of the stockholders to pass it.

At this time a more encouraging state of affairs exist. The floating debt has been largely reduced, and it is expected that it will be entirely extinguished within a short time.

Your property possesses great value and resources, and with economical management and a fair degree of prosperity in the business of the country, we think its owners may expect hereafter a regular and fair return upon their capital.

Detailed statements of the earnings and expenses, the resources of the year and disposition of same, the assets and liabilities of the company, and full statistical information of the results of the past year are hereto appended, to which your attention is invited.

The President and Board of Directors again place upon record their acknowledgment of the energy, fidelity and ability of Mr. Charles Paine, General Superintendent, Mr. Charles Collins, the Chief Engineer, and other officers of the Company.

From the other parts of the report we condense the following:

CONDENSED BALANCE SHEET.

Assets.	
1,082 miles of railroad.....	\$68,383,420 22
Equipment.....	18,550,888 93
Railroad and other shares held.....	1,638,620 50
Railroad and municipal bonds.....	789,690 39
Pacific Hotel (Chicago) stock and bonds.....	415,712 50
Bills receivable.....	842,738 18
Cash.....	456,849 73
Uncollected earnings.....	972,795 16
Individual accounts.....	35,489 95
Cleveland office building.....	11,012 14
Materials on hand.....	2,663,479 39
	\$89,802,097 09

Liabilities.	
Capital stock.....	\$50,000,000 00
Funded debt.....	31,719,000 00
Floating debt—	
Bills payable.....	\$4,736,048 31
United States tax claim.....	114,933 57
Interest due Jan 1, 1874.....	28,780 00
Dividend on guaranteed stock, Feb. 1.....	26,675 00
Other unpaid dividends.....	59,435 78
	5,223,872 66
December liabilities payable in January.....	1,430,548 99
Profit and loss.....	1,428,675 44
Total.....	\$89,802,097 09

The totals in this balance sheet last year were \$84,262,650.28, and the increase in liabilities consists of \$5,224,000 of bonds and \$1,950,305 of bills payable, the passing of the dividend decreasing these liabilities by \$2,000,000.

Taking the capital stock, funded debt and bills payable as representing the investment, it amounts to \$86,455,048, or at the rate of \$79,977 per mile of road owned, the equipment being for 100 miles of road more.

The amounts per mile are:

Capital stock.....	\$46,253
Funded debt.....	29,342
Bills payable.....	4,382
	\$79,977

In the following table of earnings and expenses the company has introduced the excellent feature of columns, showing the per centage of each item:

Pr. ct.	1873.	Earnings.	1873.	Pr. c.
72.5	\$12,824,862 20	From Freight.....	\$14,192,398 77	73.1
23.5	4,218,543 29	Passengers.....	4,539,729 74	23.6
1.8	318,367 35	Express.....	317,287 49	1.6
1.4	210,558 79	Mail.....	234,595 20	1.2
.9	39,545 64	Rents.....	43,507 69	.2
.3	58,058 01	all other sources.....	56,920 37	.3
100.	\$17,699,935 28	Total.....	\$19,414,509 26	100.

Pr. ct. of car'g. 1873. Expenses. 1873. Pr. c. of car'g.

1.09	\$ 193,612 89	General Office expenses.....	\$ 196,501 44	1.01
3.85	581,884 94	Conductors and trainmen.....	769,442 99	3.97
4.43	733,133 08	Engineers and firemen.....	904,217 79	4.65
10.22	1,807,563 27	Agents and station labor.....	2,071,504 83	10.68
.19	31,239 44	Terrace's rep'r and sup's.....	43,505 94	.22
.20	34,694 89	Gas light account.....	36,991 34	.21
4.52	799,861 01	Rep's Engines and tenders.....	774,487 35	3.99
5.48	951,107 57	" Cars.....	1,070,049 12	5.52
9.96	1,762,777 90	" Roadway and track.....	2,113,846 67	10.69
5.30	929,258 28	Steel and iron rails.....	1,877,500 83	8.12
.85	151,563 15	Repairs—Bridges.....	73,871 96	.39
.65	121,319 88	" Fences.....	67,650 14	.45
1.82	320,978 15	" Buildings.....	306,270 61	1.68
8.19	1,449,481 75	Fuel consumed.....	1,521,393 83	7.83
.92	162,824 66	Oil and tallow.....	169,140 31	.87
.25	44,059 09	Waste and rags.....	52,885 71	.27
1.37	242,331 44	Office, train and station supplies.....	276,714 14	1.43
.36	62,372 10	Dam. & loss—Fr'ght & Bag'g.....	67,863 55	.35
.17	30,653 35	Dam. to prop'y & cat'l killed.....	36,121 70	.19
.34	58,469 31	Personal injuries.....	67,719 07	.39
.16	28,079 45	Law expenses.....	65,723 47	.36
.04	6,743 50	New York Office.....	15,238 47	.08
.38	68,671 51	Rents payable.....	73,550 43	.38
1.18	200,803 67	Outside agent's and adv'g.....	220,828 86	1.14
.18	32,340 03	Contingencies.....	30,893 25	.16
2.75	497,580 70	Hire of cars.....	673,501 69	3.47
64.8	\$11,473,031 65	Total.....	\$13,288,004 29	68.5
2.1	366,493 97	Taxes.....	458,594 25	2.4
66.9	\$11,839,525 62	Total operat'g exp's & tax's.....	\$13,746,598 54	70.9
33.1	4,860,469 66	Net earnings.....	5,667,910 72	29.1
100.				100.

Here with an increase of 9½ per cent. in gross earnings there is a decrease of 3½ per cent. in net earnings, owing to the increase in the proportion of working expenses caused chiefly by a decrease in the average rates, the cost per ton per mile having risen, however, 3 per cent., and per passenger per mile 4 per cent.

Another very valuable table in this report is the following:

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Another very valuable table in this report is the following:

MILEAGE STATISTICS.

1873.		1873.
1,061.....	Average number of miles operated.....	1,154
\$16,682.....	Gross earnings per mile of road.....	\$16,824
\$11,177.....	Opt'g exp's and taxes per mile of road.....	\$11,928
\$5,508.....	Net earnings per mile of road.....	\$4,896
.67.....	Percentage of opt'ing expenses and taxes..	70.9
<i>Mileage of Trains.</i>		
7,121,795.....	Freight train mileage.....	8,026,330
\$1 30.....	Freight train earnings per mile.....	\$1 77
1 21.....	Freight train expenses per mile.....	1 25½
\$0 59.....	Net earnings freight trains per mile.....	\$0 51½

2,640,344.....	Passenger train mileage.....	2,952,823
\$1 81.....	Earnings passenger trains per mile.....	1 23½
\$0 60.....	Net earnings passenger train per mile.....	\$0 50½

Mileage of Freight and Passengers.

Freight Earning Revenue.

924,844,140.....	Tons carried one mile.....	1,053,927 189
Cents, 1.374.....	Earnings per ton per mile.....	Cents, 1.335
" 0.920.....	Expenses per ton per mile.....	" 0.946

Cents, 0.454.....Net earnings per ton per mile.....Cents, 0.389

Freight not Earning Revenue.—(Being for use of the company.)

29,129,012.....	Tons moved in freight trains one mile.....	37,655,074
Cents, 0.920.....	Cost per ton per mile.....	Cents, 0.946
\$267,987.....	Amount of cost of this transportation.....	\$366,217 00

Passengers.

162,308,495.....	Number carried one mile.....	179,363,173
Cents, 2.60.....	Earnings per passenger per mile.....	Cents, 2.55
" 1.74.....	Expenses per passenger per mile.....	" 1.81

" 0.86.....Net earnings per passenger per mile....." 0.74

A general summary of freight business for the year shows that 73 per cent. of the tonnage mileage was east-bound, earning, at 1.297 cents per ton per mile, a little more than two-thirds of the freight earnings. The increase in tonnage was 17.7 per cent. in east-bound and 15.5 in west-bound freight; in freight earnings it was 17.7 in east-bound and 3.4 in west-bound freight. In tonnage mileage the increase was 15.4 per cent. on east-bound and 10.1 on west-bound freight.

Railroad Problems Under Consideration by the German Railroad Union.

The sixth technical convention of the German Railroad Union will be held in September of this year. At sessions of the Technical Commission held in Vienna on the 20th, 21st, 22d and 23d of October, 1873, the following questions were prepared for this convention, which were communicated to all the railroads in the Union by its Executive Directory, with the request that answers be forwarded by the middle of March of the current year. From the technical organ of the Union, *Organ für die Fortschritte des Eisenbahnwesens*—we translate the questions relating to rolling stock. The questions are given under these general heads: A, Construction of Road; B, Locomotives and Cars; C, Apparatus for operating. The questions under B are as follows:

I. LOCOMOTIVES.

1. *Steel Plate for Locomotive Boilers.*—What new experiments have been made with boilers of crucible cast steel and Bessemer steel plates?

2. *Stay-bolts (Iron or Copper).*—What has been the experience with regard to the question whether it is most advantageous to use iron or copper stay-bolts in fire-boxes?

3. *Working Pressure of More than Eight Atmospheres.*—Has there been any further experience in the employment of a steam pressure of more than eight atmospheres in locomotives, and have any disadvantages resulted in applying it, or with regard to repairs?

4. *Escape of Sparks.*—Have new constructions of spark-arresters for locomotives been made, in which regard is taken to the various kinds of fuel, especially to lignite and peat, and what has been the experience with regard to them?

5. *Screw Valve-Gear.*—Has the screw valve-gear led to any inconveniences?

6. *Material of Distributing Slide-Valve.*—What material is considered most appropriate for distributing slide-valves, and how has the partial lining of the brass slide-valve on the friction surfaces succeeded?

7. *Brass Composition for Locomotive and Tender Axle-boxes.*—Has a red-metal composition been found which, without lining with alloy, has stood the test in the axle-boxes of locomotives and tenders?

8. *Exhaust Pipe.*—What construction of locomotive exhaust-pipe has proved best?

9. *Purification of Feed Water.*—What methods up to this time have been most approved for the improvement of feed-water by chemical and mechanical means, and for the prevention of incrustation,

a. By treatment of the water before use.

b. In the boiler itself.

10. *Maximum Speed of Locomotives of Specific Constructions.*—What has been the experience with regard to the maximum permissible speed for the different kinds of locomotives with relation to wheel-base, diameter of driving-wheel, radius of curves and load on the axle—especially on the forward axle?

11. *Hall's Engines.*—Are the locomotives of the Hall system approved?

12. *Locomotive Construction.*—Have locomotives with inside cylinders been made in greater proportion of late years on the railroads of the Union, and have there been any actual experiments with regard to the question whether and under what circumstances inside cylinders or outside cylinders should be preferred?

II. CARS.

13. *Methods of Lubrication for Cars and Periodic Lubrication.*—What method of lubrication is most advisable for cars, according to the latest experience?

Is a more general introduction of periodical lubrication to be sought for on the larger railroad systems?

What system of construction of axle-boxes is best adapted to this method of lubrication?

14. *Brakes.*—What new experience has been had with regard to brakes, and especially with regard to:

a. Automatic brakes.

b. The Heberlein and other quick-acting brakes.

c. The material for brake blocks.

15. *Safety Coupling with only One Safety Chain.*—On what roads has the system of coupling with only one safety chain been introduced, finally with the use of the reserve coupling, and what has been the experience concerning it?

16. *Cast-Steel Disk Wheels.*—What new experiences are there regarding cast-steel disk wheels which do not run under brake shoes?

17. *Car Heating.*—What systems for warming passenger cars and cars of the different classes have the various roads introduced; what is their cost, and has sufficient consideration been given to danger from fire?

18. *Lighting Cars.*—Has there been any further experience with regard to the lighting of passenger cars with gas?

19. *Provision of Closets.*—Does it seem necessary, according to experience hitherto, to provide water-closets on all passenger trains, or only on express and fast trains?

20. *Flying Off of Broken Tires.*—What trustworthy means are recommended to prevent tires getting loose on iron wheels, and also to make impossible the dangerous unrolling and flying off of the loosened tires?

21. *Control of Brakes.*—Does there exist any trustworthy controlling arrangement for operating the brakes, and what has been done toward attaining this object?

22. *Width of Passenger Car Bodies.*—Can the width allowable in passenger car bodies by Section 1

the inspection of the materials to be used for the axles and tires of locomotives, tenders and cars?

24. *Substitutes for Safety Chains.*—What provisions have been made on freight cars since the introduction of the Technical Regulations of 1871, in order to render unnecessary the safety chains hitherto used, and what results have been obtained?

25. *Teak-wood Wheels.*—What advantages are offered by the teak-wheels used of late years by many English and German roads, in comparison with those heretofore used, which can justify their higher price?

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—Mr. John L. Day, heretofore Assistant Superintendent, has been appointed Superintendent of the Louisville, New Albany & Chicago Railroad, in place of M. Sloat, resigned.

—Capt. George A. Le Maistre has been appointed General Freight and Ticket Agent of the Wilmington & Reading Railroad, with office at Wilmington, Del.

—John L. Edwards has been appointed General Passenger Agent of the Jacksonville, Pensacola & Mobile and Florida Central Railroads.

—A. B. Leet has been appointed General Freight Agent of the Grand Rapids & Indiana Railroad, in place of William Stewart, resigned. His office is at Grand Rapids, Mich.

—W. F. Berry, recently Assistant General Freight Agent of the Eastern and Maine Central Railroad Line, has been made General Freight Agent of the Eastern Railroad Department, with office at Boston. A. Hersey, also lately Assistant General Freight Agent, is made General Freight Agent of the Maine Central Department, with office at Augusta, Me.

—D. H. Conklin, heretofore Master of Transportation, is now Superintendent of the Gilman, Clinton & Springfield Railroad, with office at Springfield, Ill.

—Mr. A. E. Tylor, recently Auditor and General Ticket Agent, has been chosen Treasurer of the Chicago, Pekin & Southwestern Railroad Company. P. Lowell has been appointed Auditor and General Ticket Agent.

—W. P. Cosgrove, formerly on the La Crosse Division of the Milwaukee & St. Paul, has been appointed Train Dispatcher of the Winona & St. Peter Railroad, in place of E. C. Holt, resigned.

—Mr. C. J. Wilson has been appointed Secretary and Treasurer of the Macon & Brunswick Railroad Company, in place of F. Emmett, resigned.

—The board of directors of the Atlantic & North Carolina Railroad Company has chosen B. W. King, President, in place of E. B. Stanley, removed by the Governor. Mr. Stanley, however, contested the legality of his removal and Mr. King's election, but subsequently gave way.

—Mr. J. D. Cox, President of the Toledo, Wabash & Western Railway Company, announces that no appointment will be made at present to fill the vacancy caused by the resignation of Mr. A. Anderson, General Manager. Communications heretofore addressed to the General Manager will hereafter be sent to the President, at Toledo, O.

—Mr. D. K. Allen has been appointed General Freight and Passenger Agent of the Tuckerton Railroad in place of W. F. True, resigned.

—Mr. Albert Hyer, recently Vice-President, has been chosen President of the Pensacola & Louisville Railroad Company in place of D. H. Cram, resigned. Mr. L. H. Sellers is General Superintendent; T. E. Jordan, Secretary and Treasurer; F. H. Jordan, General Freight and Ticket Agent.

—The United States Circuit Court has appointed John Crerar, of Chicago, and H. L. Morrill, of Evansville, Ind., receivers of the Cairo & Vincennes Railroad.

—At the annual meeting of the Central Ohio Railroad Company in Columbus, O., April 29, the following directors were elected: Hugh J. Jewett, Joseph R. Swan, William Dennison, Isaac W. Hall, W. C. Quincy, Columbus, O.; Wm. H. Clement, Cincinnati, O.; Daniel Applegate, Zanesville, O.; Joseph B. Ford, Wheeling, W. Va.; John King, Jr., Walter B. Brooks, Joseph H. Rieman, Joseph W. Jenkins, James Harvey, Baltimore, Md. Mr. Hall is the only new director, replacing J. H. Heaton. The board re-elected H. J. Jewett President and William Wing Secretary.

—Governor Taylor of Wisconsin has appointed as Railroad Commissioners under the new law of the State for three years, Mr. J. H. Osborn, of Oshkosh, a farmer who has been an officer of the State Grange of the Patrons of Husbandry; for two years, Mr. George H. Paul, editor of the Milwaukee *News*; and for one year, Prof. J. v. Hoyt, of Madison, who is Secretary of the State Agricultural Society, was a delegate to the Vienna Exposition, and has been, we believe, a leading officer of the Wisconsin Historical Society.

—A dispatch from Omaha states that Mr. S. H. H. Clarke, late Assistant General Superintendent, has been appointed General Superintendent of the Union Pacific Railroad in place of T. E. Siskels, resigned. Mr. Siskels retains his position as Chief Engineer of the Union Pacific and Colorado Central Railroads, which he held before becoming Superintendent.

—At the annual meeting of the United States Rolling Stock Company in New York, April 23, H. B. Baltzer, H. H. Van Dyck, Wm. H. Galton, Lawrence Wells and James B. Hodgskin were elected trustees. The board elected James B. Hodgskin, President; H. B. Baltzer, Vice-President; A. Hege-waldt, Secretary and Treasurer; C. F. Jauriet, General Master Mechanic.

—The trustees under the first mortgage of the New Jersey Southern Railroad, who are now in possession of the road, have appointed Mr. W. S. Sueden General Manager. Mr. Sueden has been connected with the road almost from its beginning. He has been Chief Engineer, Superintendent, Lessee, Receiver and General Manager, and really seems to be the only man who can run the road without getting into trouble.

—The first board of directors of the St. Louis, Keosauqua & St. Paul Railroad Company in Missouri is as follows: P. G. H. Barnett, L. C. Bradshaw, T. J. Brown, B. F. Snider, Phil. Dimmitt, Chas. H. Fletcher, J. C. Hale, J. G. Brown and J. M. Collier.

—Gen. N. J. T. Dana, General Superintendent of the Chicago, Pekin & Southwestern Railroad, has resigned that position and accepted an appointment as General Superintendent of the Quincy, Alton & St. Louis Railroad.

—The officers of the Memphis and Charleston Railroad under the new administration (that of the company) are as follows: President, John D. Rafter; General Superintendent, W. J. Ross; Treasurer, S. R. Crane; Chief Engineer, Niles Merriweather; General Freight and Ticket Agent, J. C. Lopez; Auditor, E. B. Rafter. With the exception of the President the officers are all the same as under the management of the Southern Security Company.

—At a recent meeting of the North Wisconsin Railroad Company in Hudson, Wis., the following board of directors was elected: Jacob Humbird, D. A. Baldwin, John A. Humbird, A. R. Baldwin, A. L. Clarke, A. E. Jefferson, J. B. G. Roberts, Isaac Graves. Another director is to be elected hereafter. The board elected officers as follows: President, John A.

Humbird; Vice-President, D. A. Baldwin; Secretary and Treasurer, A. L. Clarke.

PERSONAL.

—The old railroad and banking firm of M. K. Jesup & Co., of New York, has been dissolved. Mr. M. K. Jesup, who is widely known for his connection with and investments in so many railroads, has formed a new firm under the name of M. K. Jesup, Paton & Co., whose office is at No. 52 William street, New York. Mr. John Crerar, of the Chicago railroad supply house of Crerar, Adams & Co., is one of the retiring partners.

—Mr. D. Stewart Hensley has resigned his position as Engineer of the Rochester & Delaware Railroad.

—Mr. George A. Brown has resigned his position as General Ticket Agent of the Chesapeake and the Ashuelot railroads.

—Mr. A. Anderson resigned his position as General Manager of the Toledo, Wabash & Western Railway, May 1. No successor will be appointed at present. Mr. E. S. Spencer has also resigned his position as Assistant General Freight Agent.

—It is stated that Mr. W. E. Dorwin, Assistant General Superintendent of the Toledo, Peoria & Warsaw Railway, has resigned his position.

—Mr. Augustus Bradley shot and immediately killed himself in Bloomington, Ill., April 28. He had at different times held the positions of Superintendent of the Little Miami road; Superintendent and afterwards Auditor of the Pittsburgh, Fort Wayne & Chicago; Superintendent of the Indianapolis, Bloomington & Western and had been connected with the Adams' Express Company. At the time of his death he was agent at Bloomington for the Indianapolis, Bloomington & Western. No reason for his suicide is given.

—Mr. William J. Ball died recently at his residence in Terre Haute, Ind. He was Engineer of the Wabash & Erie Canal during its construction, and had also been connected with several railroads.

—Mr. J. K. Fisher, who was formerly editor of the *American Artisan*, and is known to our readers by several contributions to our columns, died suddenly in his office in New York some weeks ago. Mr. Fisher was originally an artist, but most of his life was given to the study of engineering and especially of road engines, for which he made several designs, none of which, we believe, were ever carried out in construction. Mr. Fisher was extremely well informed on some branches of engineering, and was a frank, straightforward, earnest gentleman, who had little success in making money, and apparently was not so eager to do so as to accomplish some good work in the profession to which he had devoted himself.

—Mr. George S. Brown, who recently resigned his position as General Ticket Agent of the Chesapeake Railroad to accept the general agency for New England of Cook, Son & Jenkins, the managers of European tours, was recently presented with a valuable silver set by his friends on the Chesapeake road.

—Mr. Walter Shanly, one of the brothers Shanly, contractors for the completion of the Hoosac Tunnel, is mentioned as the possible or probable successor of Mr. Brydges as Managing Director of the Grand Trunk Railway. As a contractor Mr. Shanly has shown himself possessed of energy, judgment and ability to work subordinates to advantage.

TRAFFIC AND EARNINGS.

—The earnings of the Cincinnati, Hamilton & Indianapolis Railroad for the year 1873 were \$441,766.68, or \$4,508 per mile.

—The earnings of the Milwaukee & St. Paul Railway for the month of April were: 1874, \$742,000; 1873, \$574,258; increase, \$167,742, or 29½ per cent.

—The earnings of the Toledo, Wabash & Western Railway for the third week in April were: 1874, \$111,142; 1873, \$109,134; increase, \$2,008, or 1½ per cent.

—The earnings of the Great Western Railway of Canada for the week ending April 10, were: 1874, \$26,491; 1873, \$24,784; increase, \$1,707, or 6½ per cent.

—The earnings of the Grand Trunk Railway for the week ending April 11, were: 1874, \$41,000; 1873, \$39,600; increase, \$1,400, or 3½ per cent.

—The coal traffic of the Pennsylvania Railroad for the third week in April was:

Bituminous, tons (2,000 lbs.)	53,686
Anthracite	7,683
Coke	11,759
Danville, Hazleton & Wilkesbarre (anthracite)	73,122
Total	1,904

—The earnings of the Intercolonial Railway for February were: 1874, \$49,900; 1873, \$42,407; increase, \$7,493, or 17½ per cent. Earnings per mile: 1874, \$186; 1873, \$160; increase, \$26, or 16½ per cent.

—The earnings of the Burlington & Missouri River Railroad in Nebraska, for the year 1873, were:

	1873.	1872.	Increase.	Per Ct.
Passengers	\$199,805 26
Freight	390,070 17
Other sources	36,553 19
Total earnings	\$626,428 62	\$450,694 79	\$177,733 83	39½
Expenses	344,214 86	334,875 10	9,339 76	2½
Net earnings	\$282,213 76	\$115,819 69	\$166,394 07	145½

The expenses were 54.77 per cent. of earnings in 1873, and 74.30 per cent. in 1872. The earnings were \$2,618 per mile in 1873, and \$2,146 in 1872.

THE SCRAP HEAP.

The Cincinnati Exposition.

The next Cincinnati Exposition, which has taken place as one of the best and best attended exhibitions in this country, will be opened September 2, and continue until October 3. The hall and grounds will be open for the reception of articles from August 3 till September 1. Applications for space may be made at any time after May 1. Among the classes most interesting to railroad men are, under Department A—Machinery:

Class 1.—Steam engines, boilers, steam pumps, steam hammers, and all apparatus operated directly by steam.

Class 2.—Steam boiler and engine fittings, including heaters, governors, safety-valves, steam gauges, water gauges, low and high-water alarms, grate bars and appliances.

Class 5.—Machinists' tools and general metal-working machinery.

Class 6.—Wood-working machinery, tools and appliances.

Class 11.—Pressure blowers, power fans, bellows, air pumps, etc.

Class 12.—Hoisting machinery.

Department D, Class 28, is "Railroad supplies, including couplings, brakes, rail joints, etc."

The Baldwin Locomotive Works.

In a letter to the *Bulletin of the American Iron and Steel Association*, Messrs. Barnham, Parry, Williams & Co. give a

brief comparison between the condition of their business last summer and at the present time. Up to September, 1873, the works were employing 2,800 men and producing at the rate of 500 engines annually; the average monthly wages were \$163.219. This year only 1,400 men are employed, and those on three-quarters time, and the production has been at the rate of 160 engines annually; the average monthly wages are \$53,027. In 1873 the whole number of locomotives turned out was 497, of which 96 (23 per cent.) were for foreign markets and 341 for home use. In the first three months of 1874 there were built 40 locomotives, of which 27 (67½ per cent.) were for export and only 13 for home use.

Railroad Manufactures.

The Indiana Car Company's shops at Cambridge City, Ind., employ about 300 men and are running on an order for 500 box cars for the Red Line and for the Baltimore & Ohio road.

The shops of the Allegheny Car and Transportation Company at Swissvale, near Pittsburgh, Pa., are now completed and in operation. The principal buildings are the erecting shop, 220 by 75; the machine shop, 126 by 75; the blacksmith shop, 112 by 50, and an engine and boiler house, 50 by 24 feet. The shops are fully supplied with tools.

ANNUAL REPORTS.

Oatawissa.

This company's road extends from Tamanend, Pa., to Williamsport, 92½ miles, and is leased to the Philadelphia & Reading Company at a rental of 30 per cent. of the gross earnings.

For the year 1873 the report of the company gives the gross earnings as \$713,011.88, an increase of \$35,485.82, or 5½ per cent. over the preceding year. The rental for the year is \$213,903.54. The lessees have expended on roadwork in relaying new iron rails (68 lbs. weight), on 50 miles of the road, to fit it for an increase of the trade, \$142,777.86—relaying 5,055 7-30 tons of iron; the sidings at all the important stations on the line have also been renewed; their determination, as expressed, being to place the line in as thorough condition for work as that of their own road. The amount expended, as per their report during the year on roadwork, in addition to new iron, was \$207,906.40.

There has been no change in the capital account, which now stands as follows:

Preferred stock	\$1,159,500
Common	3,200,000
Funded debt	1,740,350
Total	\$6,099,850

Lake Ontario Shore.

This company's road is now in operation from Oswego, N. Y., west to Ontario, 52 miles, and the grading is substantially completed for 20 miles further, to Charlotte. It has an equipment of 6 engines, 2 baggage and 8 passenger cars, 101 box and 100 flat cars, a snow plow and 6 hand-cars. The report gives a general history of the year, but no statement of the receipts, except to say that the earnings have exceeded the operating expenses. By curtailing expenses and incurring no new obligations the company passed safely through the panic of last fall. It is hoped that the road can shortly be completed to Charlotte, when a considerable increase of business may be had. The contractors have been much embarrassed by litigation concerning town bonds. Of \$1,920,000 capital stock subscribed, \$1,745,200 is owned by towns and cities along the line. The road is intended to run to the Niagara River.

CHICAGO RAILROAD NEWS.

Chicago & Illinois River.

The contractors are at work between Braidwood, Ill., and Streator, and it is said that the work is to be pushed forward.

Chicago & Paducah.

Work on the extension from Windsor, Ill., south to Altamont, the crossing of the Springfield & Illinois Southeastern and the Vandalia Line, is progressing. It is intended to have this section of road, which will be about 55 miles long, completed by the end of June, when cars will be run through to Shawneetown, on the Ohio. Trains will pass over the Springfield & Illinois Southeastern from Altamont to Shawneetown. Track was laid last year on 15 miles of this line, from Windsor southward.

Illinois Central.

The regular fruit train will be put on this road between Chicago and Cairo about the 15th inst., when strawberries are expected to come forward briskly.

Chicago, Burlington & Quincy.

A suit has been commenced at Macomb, Ill., against this company by the Railroad Commissioners for extortion, or overcharges under the railroad law.

OLD AND NEW ROADS.

Atlantic & Great Western.

Mr. J. M. McHenry recently arrived in New York from England, his avowed object being to arrange for the lease of the road to the Erie. A dispatch from London, under date of May 2, gave a report that before leaving England, President Watson had signed an agreement to make such a lease at a rental of 35 per cent. of the gross earnings, with a guarantee that the rental should be sufficient to pay interest on the bonds. This has not been confirmed, and it is moreover stated in New York that President Watson is opposed to any lease whatever of the Atlantic & Great Western by the Erie. To a reporter of a New York newspaper Mr. McHenry stated that if the lease was not made, arrangements would be made to transfer the through traffic from the Erie to some other line—probably the New York Central. With the latter road the Atlantic & Great Western will be connected in a short time by the Rochester & State Line road, from Salamanca to Rochester, which will probably be finished during the coming summer. The Atlantic & Great Western is burdened with an enormous debt, and it is not to be wondered at that the Erie managers should hesitate about making a lease.

It is proposed, after the gauge of the road is changed, to build a line of about eight miles from the main line near Clarksville, Pa., to Sharon, the terminus of the Mahoning Division. This new line and the Mahoning Division from Sharon to Leavittsburg (where it crosses the present main line) will be used as the main line, and the old road from Clarksville to Leavittsburg will be abandoned. This section of the line has some heavy grades and passes through a country producing very little local traffic.

St. Louis, Kansas City & Northern.

The St. Louis *Republican* says that the agreement which has been in existence for two years past between this company, the Kansas Pacific, Chicago & Alton and the Pennsylvania Company, under which each company was bound to deliver to its associates all the traffic, both freight and passengers, it could control, either on its own line or that came to it from whatever source, has been terminated, and the trust under which the St. Louis, Kansas City & Northern common stock was held as security for its performance of the agreement has been canceled. The company is now left free to make what disposition may seem best of its business.

Arrangements are being made for the building of a new freight depot in St. Louis, in a place much more convenient for the transaction of the business than the present depot.

Union Pacific.

Judge Donohue, in the New York Supreme Court, May 5, in the case of Simpson against this company, refused to continue the injunction asked for by the plaintiff to prevent the company from selling the bonds executed under the new sinking-fund mortgage. The Court held that the plaintiff's rights, as a holder of income bonds, were fully protected by the terms of the new mortgage.

Pacific of Missouri.

The Supreme Court of the United States has reversed the decision of the lower court in the tax cases and has decided that the company was not liable for the tax of 10 per cent. on gross earnings assessed upon it in 1866 and 1867, the payment of which the company contested. The main reason for the decision is the clause in the charter which exempts the company from taxation until two years after it should be completed to the western line of the State. This time had not expired when the 10 per cent. tax was levied under the convention ordinance of 1865. Justices Clifford and Miller dissented from the opinion.

The St. Louis Circuit Court has made perpetual the temporary injunction restraining the city of St. Louis from interfering with the track laid through Poplar street in that city to connect the depot of the road with the levee. The city, however, will probably appeal from the decision.

Function & Breakwater.

It is reported that the Philadelphia, Wilmington & Baltimore Company has purchased a controlling interest in the stock of this company from Mr. Thomas Baumgardner, of Lancaster, Pa., who was the contractor for the construction of the road. This purchase will substantially complete the control by the Philadelphia, Wilmington & Baltimore of the railroad system of Delaware. The road is 30 miles long, from the end of the Harrington Branch of the Delaware road, at Harrington, Del., by a very circuitous route to Lewes, on Delaware Bay. The road is said to be in poor condition and has a very light equipment and indeed a very light business, its earnings last year having been \$1,650 per mile. There is a mortgage of \$400,000 on the road to the State of Delaware. The road has never earned enough to pay interest until last year, when there was a surplus of \$5,841, after paying it. It is said that the new owners will construct this year the projected extension of five miles from Lewes to Rehoboth Beach, a popular summer resort.

Baltimore & Ohio.

In one of the suits against the Parkersburg Branch Company, to recover money paid on certificates of stock fraudulently issued by the late Treasurer, the United States Circuit Court has decided in favor of the plaintiff, holding that he is entitled to recover from the company. The case is to be taken to the United States Supreme Court. The decision in this case will probably govern all the others.

North Wisconsin.

The company has formally accepted the share of the St. Croix land grant appropriated to its road by the late Wisconsin Legislature and has undertaken to build the road required. The bonds required as security for the fulfillment of the conditions have been executed and submitted to the Governor, who signified his approval, and the bonds were subsequently filed.

Erie Canal.

The Erie Canal is now fully opened for the season. Boats commenced passing into the canal at Buffalo, May 5.

Pacific Mail.

The company has published a statement dated May 1. The freight carried between New York and San Francisco during the year 1873 was 9,400 tons; for the first four months of 1874 it was 9,243 tons. The passenger business has also shown a very large increase, while there has been a considerable reduction in expenses, especially in cost of fuel. There are 33 steamers in commission, six of them being new iron steamers. The City of Peking is nearly ready for use, and a companion steamer, the City of Tokyo, will be launched in May. The business on the China and Central America lines is increasing. Since December 1 last the floating debt of \$360,000 has been extinguished and \$508,000 paid on the new ships. The new iron ships have been insured for \$2,000,000.

Rockford, Rock Island & St. Louis.

Mr. H. Osterberg, Publisher of the *German-American Economist*, of Frankfort, has been sent to this company by the bondholders to take steps to enforce their rights, and will probably foreclose the mortgage. Mr. Osterberg was for many years a resident of the United States.

Frankfort & Kokomo.

The superintendent reports that the grading and bridging is almost entirely completed. Iron has been purchased for the whole line. Track-laying was commenced March 20, and since then 15 miles have been laid from Frankfort, Ind., northeastward. The construction train is running from Frankfort to Russellville, within 8 miles of Kokomo. The company expects to have the road completed by June 1. The road extends from Kokomo, Ind., southwest to Frankfort, 35 miles, and forms a short connection between the Logansport, Crawfordsville & Southwestern and the roads intersecting at Kokomo.

South Mountain & Boston.

Work on the grading of this road is progressing steadily. There has been no delay or suspension of work since it was begun, except such as was caused by unfavorable weather.

New York Central & Hudson River.

A clerk in the Treasurer's office in New York recently disappeared suddenly, and upon investigation was found to have taken with him \$32,000 of the company's money. At latest accounts he had not been arrested.

Sunbury & Lewistown.

This road was sold in Philadelphia, May 5, under foreclosure of the first mortgage of \$1,200,000. It was purchased for \$351,000 by Malcolm Campbell, as agent for the trustees under the mortgage. The road is 42 miles long, from Lewistown, Pa., on the Pennsylvania Railroad, northeast to Selinsgrove on the Philadelphia & Erie. It has been operated by the Pennsylvania Railroad Company as the Lewistown Division.

Texas & Pacific.

The contractor has completed the grading of the first section of 10 miles from San Diego, Cal., which extends north-westward up the coast. The work has been accepted and is now ready for the iron.

Woodstock.

Another attempt is being made to raise the funds necessary to complete the road. It is proposed to begin track-laying at White River Junction, Vt., and to go on as fast as money comes in. The estimated amount required is about \$180,000.

Canada Pacific.

In the Canadian Parliament at Ottawa, May 5, on the question of voting an appropriation for the surveys, Mr. Mackenzie gave a statement of the progress made in the Lake Superior country. He stated that on the Western section, over the Cas-

cade Mountains, the best route yet found required a grade of 150 feet to the mile for a continuous stretch of 15 miles. The Government proposed to make the most complete surveys possible, being warned by its experience with the Intercolonial road of the inexpediency of beginning great works without the fullest information.

Providence & New York Steamship Company.

The business of this company, owner of the Neptune Line between New York & Providence, has been consolidated with that of the Stonington & New York Steamboat Company (Stonington Line). The steamboats of the two lines continue to run as usual, but they are under one management, Mr. D. S. Babcock, late President of the Stonington Company, being Manager of both lines.

Keokuk & Des Moines.

Work has been commenced on the renewal of the track, and new iron is to be laid on the whole road. It is said to be much needed, the road having been in very poor condition for some time.

St. Louis & Iron Mountain.

At a meeting of the stockholders in St. Louis, May 1, it was voted to ratify the agreement of consolidation with the Cairo & Fulton. The latter company was to meet in Little Rock, May 4, to vote on the agreement.

Kent County.

This company, having failed to pay the rent due, has been enjoined from running its trains over the line from Massey's to Townsend, Del., which it, jointly with the Queen Anne's & Kent, leases from the Delaware Railroad Company. A part of the rolling stock has been levied on on judgments obtained by creditors.

Ouyahoga Valley.

The arbitrator to whom had been submitted a dispute between the company and the contractors, Vansickel & Conger and T. P. Corderoy, recently made a report awarding to the contractor the whole amount of his claim, which, with interest, amounts to nearly \$86,000. Officers of the company, however, state that the company, fearing that justice would not be done, withdrew from the arbitration some time since, and is therefore not now bound by the decision. The case will go to the courts.

Pennsylvania & Delaware.

It is stated that the permanent lease of this road to the Pennsylvania Railroad Company has been prepared and will shortly be signed. The road has heretofore been operated by the Pennsylvania under a temporary agreement. It is 38 miles long, from Pomeroy, Pa., southeast to Delaware City, Del.

Kansas City, St. Joseph & Council Bluffs.

Through cars are now run from Omaha to St. Louis over this road and the Missouri Pacific.

New York, Providence & Boston.

This company is building a line known as the Wood River Branch, which leaves the main line at Richmond Switch, R. I., 14 miles east of Stonington, and runs near Woodville to Hope Valley and thence to Lonsville. The grading is now completed and the rails are being laid.

South & North Alabama.

In order to encourage settlement on the line of the road, this company has resolved to sell its lands at the lowest possible price and at reasonable terms, to extend all possible facilities to parties desiring to develop mining properties or establish furnaces, foundries, etc., and to give low rates on coal, iron ores and similar freights.

South Side, of Long Island.

The Legislature of New York has passed the bill giving the company authority to build a branch to its wharf property on Newtown Creek. It was intended to make this the principal terminus of the road, but it is not probable that anything will be done while the affairs of the company are in their present condition.

No further change has taken place in the various law suits affecting the possession of the road.

New York & Oswego Midland.

The trustees under the first mortgage request all holders of first-mortgage bonds to meet with them at Room 24, Cooper Union Building, New York, Friday, May 15, at 4 p. m.

Judgments against the company amounting to about \$275,000 have been filed in Oneida County, N. Y., by the firm of Perkins, Livingston & Post.

The plan of reorganization prepared by the Oddyke committee has been somewhat modified, but still retains as its main features the issue of securities by the new company to cover all the present debt, and the purchase of the Montclair road and its completion to Middletown. Heidelberg, Frank & Co.'s committee appears to have withdrawn from the field, leaving the Oddyke committee and Allen, Stephens & Co.'s committee the only representatives of the bondholders, the latter insisting mainly upon the rights of the first-mortgage bondholders, while the former endeavors to bring in all classes of debtors.

Rochester & State Line.

A large force has been set to work on the ballasting and track-laying, and it will be increased as fast as the weather allows the men to be worked to advantage.

Chicago & Lake Huron.

Indianapolis papers of April 30 state that the United States Court has appointed Mr. W. L. Bancroft (the General Manager of the road) Receiver of that part of the road in Indiana. Mr. Bancroft had previously been appointed Receiver for the Michigan section of the road.

Dayton & Union.

It is stated that the litigation over the control of this road has been ended by a compromise. The Cleveland, Columbus, Cincinnati & Indianapolis Company will continue to operate the road, dividing a certain portion of the profits with the Cincinnati, Hamilton & Dayton.

Cincinnati Southern.

The contract for sections 86, 100 and 103 in Pulaski County, Ky., has been awarded to Reed & Flannery, of Louisville, Ky. These three sections include some very heavy rock cutting, about 2,900 lineal feet of tunneling and the masonry for the Cumberland River bridge. The right of way through Scott County, Ky., north of Lexington, has all been secured.

Peoria, Atlanta & Decatur.

Track is laid from Atlanta, Ill., northwest to Minier, 13 miles, and construction trains are running that distance. The work is going forward steadily.

Mississippi Valley & Western.

The trains of this road no longer run into Quincy, Ill., over the Quincy bridge. Passengers are landed on the west side of the river at West Quincy.

Atlantic & North Carolina.

Mr. E. R. Stanly, the late President, at first refused to recognize the order of the Governor removing him from office, and declined to give the new President, Mr. King, possession of the road. Mr. King thereupon applied to the Craven County Superior Court at Newberne, N. C., and the Court appointed

Hon. George Greene Receiver with authority to take possession of the road and all property appertaining thereto. The Receiver subsequently reported that Mr. Stanly had surrendered possession of the property, whereupon he was discharged from the receivership by the Court, and President King and the re-organized board were left in possession.

The board of directors has rescinded the resolution approving the lease to the Midland North Carolina Company, and has also passed a resolution favoring the consolidation with the North Carolina Railroad Company, provided the Atlantic & North Carolina stock is valued at not less than \$10 per share.

Delaware, Lackawanna & Western—Morris & Essex Division.

Work has been commenced on some considerable alterations in the Hoboken yard. A local freight house 75 by 400 feet is to be built, facing on Ferry street, in such a position that teams will not be required to cross any tracks to receive or deliver freight as at present. The building will have two stories, the upper one being used for offices and store rooms. The old freight houses will be torn down, as will the round-house and machine shop and some of the coal trestles. A new round-house will be built just beyond the end of the present yard, and the shops will be moved to Kingsland, the first station on the Boonton Branch, where new buildings are now nearly finished and ready for use. No change will be made in the passenger depot until the new tunnel is finished, when a permanent depot will be put up and slips built for the new ferry. The new freight house is to be built at once and will, it is expected, be finished by September next.

Pennsylvania—New York Division.

Preparations are being made for a change in the manner of running trains. The trains on all the New Jersey lines have always run on the left-hand track where there is a double track, but are hereafter to run on the right-hand track, as on the Pennsylvania lines. Considerable work is to be done in changing switches, moving watering tanks and cranes and re-arrangement of depots, and the change in running will probably not be made before June.

A track-tank, or "jerk-water," is to be built near Monmouth Junction, 41 miles from Jersey City and 48 from Philadelphia. This will be used by express trains, and will be the only one on this division.

The force at work on the shops at the Meadows, west of the Hackensack, has been increased, and the unfinished buildings are now making considerable progress. All the shops are under roof but the freight repair shop and two or three small buildings.

St. Paul & Pacific.

The bill to extend for two years the time for the completion of the St. Vincent Extension has been passed by the Senate.

It is stated that the bondholders will contest all the claims filed under the new lien law in Minnesota, and will seek relief from the next Legislature. They claim that they have already furnished money to pay these claims. It is also said that they can hold lands already acquired on the St. Vincent Extension, for which patents will soon be issued, and that the lien law will be void as to those lands. It is possible that the portion of the line from Melrose to Glyndon and the Brainerd Branch will be abandoned, and the line now built from Glyndon north will be connected with the St. Paul & Pacific main line at Breckenridge, by building from Glyndon south to Breckenridge.

Paola & Fall River.

It is stated that work on this road is being pushed forward. The iron for 25 miles has been purchased, and it is intended to have 25 miles of road from Garnett, the crossing of the Leavenworth, Lawrence & Galveston, southwest to Leroy, finished within a short time. The road is to extend from Paola, Kan., the western terminus of the Missouri, Kansas & Texas Company's Osage Division, southwest to the Arkansas River.

Minnesota & Northwestern.

It is stated that contracts for the lines from Wells, Minn., north by west to Mankato, 35 miles, and from Wells west by south to Blue Earth City, 25 miles, have been let to responsible parties, the grading to be completed by September next.

Meetings.

The following companies will hold their annual meetings at the times and places given:

Pacific Mail Steamship Company at the office in New York, May 27, at 3 p. m. Transfer books will be closed from May 16 to May 23.

Cheshire Railroad Company at Keene, N. H., May 13.

Chesapeake & Nebraska at Clinton, Ia., May 19.

Colorado Central at Golden, Col., May 20, at 2 p. m.

Illinois Central in Chicago, May 27, at 11 a. m. Transfer books will be closed from May 13 to June 2.

Chicago & Northern Pacific Air Line at the company's office, No. 87 East Washington street, Chicago, June 10, at 10 a. m.

Dividends.

Dividends have been declared by the following companies:

Boston & Maine, 4 per cent., semi-annual, payable May 15.

Pennsylvania Railroad, 5 per cent., semi-annual, payable May 30.

Seaboard & Roanoke, 4 per cent., payable May 1.

Memphis & Charleston.

The special meeting of the stockholders in Memphis lasted over two days, April 29 and 30. About three-fourths of the stock was represented, and there was an extended discussion of the company's affairs. The stockholders finally voted unanimously to ratify the agreement made with the Southern Security Company to release that company from the lease. By the terms of the agreement the Southern Security Company turns over to the Memphis & Charleston Company the road and branches with all the equipment and personal property, and also gives 3,150 acres of land and its notes for three years for \$50,000. The Memphis & Charleston assumes all outstanding debts.

In the meeting it was stated that the road-bed and equipment were in better order than when leased, but that the rails were in very poor condition.

The official transfer was made April 30, and the road was received by the President of the Memphis & Charleston Company on that day.

Houston & East Texas.

It is reported that arrangements are being made for the construction of this projected road. It is to extend from Houston, Tex., northeast through Liberty, Tyler and Shelby to the State line at Logansport where it will connect with a line to Shreveport, La. There is also to be a branch eastward through Jasper and Newton counties to the Sabine to connect there with a projected extension of the Baton Rouge, Groesbe Tete and Opelousas road. It is proposed to make the road of 3-foot gauge.

The Wisconsin Railroad Law.

Mr. Alexander Mitchell, President of the Milwaukee & St. Paul Company, has addressed a letter to the Governor of Wisconsin in which he says that under its charter the company has power to fix its own rates. Since its organization the company has never earned over 6 per cent. on the cost of its property, and the reductions prescribed by the law would prevent all dividends. The directors, as trustees for the stockholders, believe it their duty to disregard so much of the law as attempts arbitrarily to fix rates of compensation.

Mr. Keep, President of the Chicago & Northwestern, has

also written a letter to the Governor, in which he says that the law would amount virtually to confiscation in the case of that road, as under its provisions the road could hardly earn its working expenses.

Neither company is complying with the law, but no suits have yet been commenced.

The Governor has issued a proclamation reciting the anticipated disregard of the law by the companies, and announcing his intention of enforcing it.

Old Colony.

A special meeting of the stockholders will be held in Boston, May 12, to vote on the acceptance of the act recently passed by the Legislature to authorize the company to hold stock in certain steamboat companies. Also, if the act is accepted, to provide means for the purchase of such stock, by the issue of bonds or otherwise.

Savannah & Charleston.

In the suit of Hand against this company, the Court made an order, April 23, placing the road in possession of C. T. Mitchell, as Special Receiver. Under the decree the road will remain in his hands until the maturity of the 6 per cent. mortgage bonds of 1857, which become due in March, 1877.

Lake Shore & Michigan Southern.

In the case of Chase against this company in the New York Supreme Court, in which equitable remedies were asked for to compel the company to fulfill a guarantee of 10 per cent., on Michigan Southern & Northern Indiana bonds, given at the time of the consolidation, the Court has given its decision. The suit was based upon a claim for two years' unpaid interest on guaranteed bonds which accrued before the consolidation. The Court decided that the case was not such as to come under its equity jurisdiction, but merely involved a claim of debt and damages to be enforced by a suit at law.

Oil Creek & Allegheny River.

It is stated that this company has failed to pay the May interest on its consolidated (second) mortgage bonds. The amount of these bonds is \$1,100,000. The company hopes to be able to meet the payment in a short time.

Louisville, Cincinnati & Lexington.

The strike of the employees is at an end, and trains are running as usual. The men have all returned to work, and no more trouble is apprehended.

A meeting of bondholders was held at Louisville, Ky., April 23, and resolutions were adopted favorable to the terms proposed by the company for funding the coupons for 1874 and 1875 in the consolidated bonds. This action, of course, is merely advisory, and has no binding effect upon any of the bondholders.

Selma, Rome & Dalton.

The commissioners appointed to make the foreclosure sale by the Alabama Chancery Court give notice that the sale will be held at Selma, Ala., June 30. The road, which includes the line from Selma northeast to the Georgia line, 172 miles, will not be sold for less than \$1,200,000, of which \$200,000 must be paid on the day of sale. The equipment and personal property will be sold for not less than \$510,000, of which \$15,000 must be cash, and the lands for not less than \$250,000, \$30,000 down. The 64 miles of the road in Georgia are not included in the sale.

Butland.

It is reported that the recent meeting of representatives of this company and the Central Vermont resulted in a disagreement. It is believed that the lease will be broken and the Butland road, with its leased lines, turned over to the stockholders.

Milwaukee & St. Paul.

The plans have been prepared for the new elevator to be built in Milwaukee. It is to be 86 by 333 feet and will have a storage capacity of 1,250,000 bushels of grain. Mr. Alexander Miller, builder of the Fulton elevator in Chicago, has prepared the plans and will superintend the construction of the building.

The foundations of the new depot in La Crosse are completed and the superstructure will soon be commenced. Both freight and passenger houses will be of brick and substantially built.

Des Moines & Minnesota.

The work on this road is being pushed forward steadily. The company hopes to have the line open to Ames, on the Chicago & Northwestern and 30 miles north of Des Moines, by July 1.

Cairo & Vincennes.

The company not having filed satisfactory security with the Court, the United States Circuit Court, April 30, appointed two receivers to take possession of the property pending the trial of the suit of Winslow & Wilson against the company. John Crerar, of Chicago, and Henry L. Morrill, of Evansville, Md., are the receivers. Mr. Crerar is well known as the head of the great railroad supplies firm of Crerar Adams & Co., of Chicago, and until this month a member of the banking firm of M. K. Jesup & Co., of New York; Mr. Morrill was Superintendent of Construction under Winslow & Wilson when they were building the road. A motion for a rehearing has been filed on behalf of the company.

Fitchburg.

A new freight tariff took effect May 1, which makes a general reduction of 12 to 15 per cent. in rates. Heavy freights, such as lumber and pig iron are charged \$17 per car-load of 10 tons from Boston to Fitchburg, which is 3.4 cents per ton per mile. Special arrangements are made for through Western freight.

Rome, Watertown & Ogdensburg.

Work has been begun on a branch line, 1½ miles long, from Antwerp, N. Y., to the Dixon iron ore beds. It is being built by the Northern New York Iron & Mining Company.

Shreveport & Southwestern.

The City of Shreveport, La., voted, April 25, by a majority of 97 in a total vote of 713, to subscribe \$300,000 to the stock of this road. This will, it is said, secure the construction of the road from Shreveport to the Texas line.

Washington City, Virginia Midland & Great Southern.

The Danville Extension is completed and construction trains have passed over it. The ballasting is nearly done, and it is expected that regular trains would begin running May 3.

Carolina Central.

Work on the rock-cutting at Boggan's Out is progressing steadily, and it is believed that the track will be laid through it by the middle of May. A track is being laid beyond the cut, and when the latter is finished it will take but a short time to complete the road to Charlotte.

Erie & Huron.

The line of this projected road is from Rondeaux Harbor, Ont., on Lake Erie, northwest through Chatham and Dresden, and thence nearly due north to Port Errol on Lake Huron, a distance of about 60 miles. There will also be a branch of about 10 miles from Dresden west to Wallaceburg. The com-

pany expects to get bonuses to the amount of \$3,700 per mile and has a Government grant of \$2,000 per mile. The northern half of the road will be nearly parallel to and about 10 miles east from the St. Clair River.

Jersey City & Albany.

Trains are to begin running over this road, which has been closed since last fall, May 11. It will be operated by the New Jersey Midland Company and worked as a branch of that line.

Central Vermont.

It is reported by Vermont papers that a controlling interest in this company has passed into the hands of John B. Page and John Gregory Smith, two of the old Vermont Central trustees.

New Jersey Southern.

The New Jersey courts have ordered Mr. W. S. Sneden, the present Receiver, to deliver up the property to George B. Upton and Benjamin Williamson, trustees for the first-mortgage bondholders. The trustees intend to operate the road and all its branches, and will probably arrange with Mr. Sneden to operate it for them.

Other suits are pending before the New Jersey Court of Chancery, and it is thought probable that there will be an extended litigation before the affairs of the company can be settled. The road will most likely be sold under foreclosure.

New Brunswick Railways.

The New Brunswick Government has introduced a bill into the Provincial Assembly providing for subsidies to the following lines, the approximate length of each being given:

From St. John westward to St. Stephen (opposite Calais, Me.), 70 miles.

From Fredericton or St. Mary's northeast to the Intercolonial near the Miramichi River, 100 miles.

From Fredericton or St. Mary's east past the head of Grand Lake to the Intercolonial in Welford, Kent County, 85 miles, with a branch from Grand Lake to the St. John & Shediac line of the Intercolonial near Petitcodiac, 55 miles.

From Wausan, on the Fredericton Branch, northeast to the mouth of the Oromocto River, 10 miles.

From Gagetown southwest to the European and North American near Welford, 25 miles.

From St. Martin's at Quaco Harbor northwest to the St. John & Shediac line near Hampton, 30 miles.

From Cape Tormentine west to the Intercolonial near the Missouash River, 20 miles.

From Elgin Corner northward to the St. John & Shediac line near Petitcodiac, 15 miles.

From Richibucto westward to the Intercolonial near Welford, 35 miles.

From Carleton Place westward to the Intercolonial in Bathurst Parish, 40 miles.

From Tobique Village westward to the mouth of the Aroostook or to the Maine line near Fort Fairfield, 30 miles.

From Dalhousie to the Intercolonial in Restigouche Parish, 5 miles.

This makes a total of about 520 miles of road for which a subsidy of \$5,000 per mile is to be paid. Most of them are in the northern and central sections of the province, which is a sparsely settled but heavily timbered country.

The subsidies are to be paid to the parties who may agree to build any of the lines in installments, \$20,000 being payable when \$50,000 has been expended on the work. The subsidies will be payable either in cash or provincial debentures and will be a first lien on the road. Funds are to be supplied as far as possible by sales of crown lands. An engineer is to be appointed who shall have supervision of the construction of the lines.

Finally, the grants will lapse unless contracts are made with some company or companies to construct them within five years, and work must be commenced within six. Failure to build one or more of the lines will not affect the subsidy for the others.

Report of the Senate Committee on Transportation Routes.

In the United States Senate, April 24, Hon. William Windom, of Minnesota, presented the report of the Special Committee on Transportation Routes, and spoke at length in explanation of it. This committee was appointed near the close of the last session of Congress, with authority to take testimony during the vacation. It held a number of sessions in various parts of the country, and visited several of the routes proposed for new canals. Mr. Windom, in his speech, began with a resume of the principal subjects which have engaged the attention of the Committee, which are enumerated as follows:

First—The annual average price of wheat and corn during the five years 1868 to 1872, inclusive at Chicago and Milwaukee and at points west of these cities; at Buffalo, Montreal, New York, St. Louis, New Orleans and Liverpool.

Second—The quantity of grain received and shipped from all the lake ports and ports on the Ohio and Mississippi Rivers, and ports on the Atlantic and Gulf coasts.

Third—The total shipments of grain to the States on the Atlantic sea-board; the quantity distributed between the western and eastern borders of these States; the total quantity consumed in the New England States, the Atlantic States south of New England, and the total quantity exported; also, the quantity of grain shipped to the Gulf States, and the quantity exported from these States; the quantity exported to Canada and also from the Pacific coast to foreign countries.

Fourth—The shipments of grain from the West to the East and South by the various water and rail routes.

Fifth—The average annual freight charges from point to point.

Sixth—The statistics of Great Britain on this subject for the past thirteen years.

Lines of Improvement Examined.

He said the committee have personally examined and most carefully investigated the following proposed water lines of transport: The proposed Caughnawaga & Lake Champlain route, from the River St. Lawrence to New York; the Oswego & Oneida Canal route, from Oswego to New York; the Erie Canal route, from Buffalo to New York; the James River & Kanawha Canal, or central water line, from Richmond to the Ohio River; the Atlantic & Great Western Canal, from the Tennessee River to Savannah, Ga.; the proposed ship-canal across the peninsula of Florida; the improvement of the Ohio River; the improvement of the Mississippi above the Falls of St. Anthony, between St. Paul and St. Louis, and between St. Louis and New Orleans; the Fort St. Philip Canal, and other plans for improving the mouth of the Mississippi River; the Wisconsin & Fox Rivers improvement; the Rock Island & Hennepin Canal, and the Niagara Ship-canal. In addition to these routes the committee have obtained information in regard to the canals of Pennsylvania, and the Chesapeake & Ohio Canal.

The inquiries of the committee in regard to railroads have embraced among other subjects the following: Combinations between different lines; the consolidation or amalgamation of lines; fast freight lines; the issuing of stock not representing money paid in for construction, a device commonly known as "stock-watering;" competition between railroads and water lines; the relative cheapness of the various methods of transportation; the regulation or control of existing railroads by States and by the National Government, involving the questions as to the limitation of the powers of Congress under the

commercial clause of the Constitution, the construction of one or more double-track freight railroads by the Government, to be operated by the Government or leased to parties who shall operate subject to Government control, and many others.

In pursuing their inquiries, the committee have encountered many difficulties, both from the extent and magnitude of the subject, and the singular fact that very few, if any, Governmental statistics of the vast internal commerce of the country have ever been collected. For the future they recommend the establishment in one of the Executive Departments of a Bureau of Commerce for this purpose.

Magnitude of the Internal Trade of the Country.

The committee had no means of estimating accurately the magnitude of our internal trade; but its colossal proportions may be inferred from two or three known facts. The value of commodities moved by the railroads in 1872 is estimated at over \$10,000,000,000, and their gross receipts reached the enormous sum of \$473,241,055. The commerce of the city of the Ohio River alone has been carefully estimated at over \$1,600,000,000 per annum. Some conception of the immense trade carried on upon the northern lakes may be formed from the fact that during the entire season of navigation in 1872 an average of one vessel every nine minutes, day and night, passed Fort Gratiot Light-house, near Port Huron. It is probably safe to say that the value of our internal commerce is ten times greater than our trade with all foreign nations, and that the amount annually paid for transportation is more than double the entire revenues of the Government.

The Problem Presented, and the Solution.

By reason of the failure of existing systems of transportation to fully meet the conditions of cheap and ample facilities for the interchange of commodities between the widely-separated sections of our country, the following important problem propounds itself: "How shall cheaper and better facilities for transportation be provided?" The remedies which have been suggested are four in number:

First—Competition between railroads and its promotion, by additional lines without regulation.

Second—Direct Congressional regulation of railway transportation, under the power to regulate commerce among the several States.

Third—Indirect regulation, and promotion of competition through the agency of one or more lines of railway, to be owned or controlled by the Government.

Fourth—The improvement of natural water-ways, and the construction of artificial channels of water communication.

At this point the question presents itself: "What are the nature and extent of the powers of the National Government in this matter, and how they may affect the laws of the States?" In the discussion of this question the report maintains the following propositions:

First—That the powers of Congress, whatever they may be, are derived directly from the people of the several States, and not from the States themselves.

Second—That every important word in the clauses which confer the "power to regulate commerce among the several States," and to "make all laws which shall be necessary and proper for carrying it into execution," has received legislative, executive, and judicial construction, and that under such construction the power of Congress to regulate inter-State transportation by railroads, and to aid and facilitate commerce, is clearly established.

Third—That in the exercise of this power Congress is authorized under the grant of auxiliary powers to employ such means as are appropriate and plainly adapted to their execution.

Fourth—That in the selection of means by which inter-State commerce shall be regulated Congress may: 1. Prescribe the rules by which the instruments, vehicles, and agents engaged in transporting commodities from one State into or through another shall be governed, whether such transportation is by land or water. 2. That it may appropriate money for the construction of railroads or canals, when the same shall be necessary for the regulation of commerce. 3. That it may incorporate a company with authority to construct them. 4. That it may exercise the right of eminent domain within a State in order to provide for the construction of such railroads or canals; or 5. It may, in the exercise of the right of eminent domain, take for the public use, paying just compensation therefor, any existing railway or canal owned by private persons or corporations.

Competition, Combination and Monopoly.

In regard to the respective merits of the four different remedies above mentioned, the following facts are submitted: First, as to competition between railroads and its promotion by additional lines. In Great Britain, Parliament, with unlimited powers, having struggled in vain for forty years against amalgamation by fostering voluntary competition, has been compelled to confess itself defeated. In process of time the great roads there, as in this country, have swallowed up the smaller ones, and by purchase, lease, arrangement of rates, or some other of the numerous forms of combination and consolidation, laid tribute the respective sections of which they were the main arteries. In the main trunk lines of the United States from Chicago to the East, the Pennsylvania line, running to New York and Philadelphia; the Lake Shore & Michigan Southern, running in connection with the Erie and New York Central; and the Michigan Central Railway, in connection with the last two, and also the Grand Trunk, competition has already substantially disappeared. The agents of these lines meet together at Chicago, and agree on prices for east-bound freight; and the prices established by such agreement bind the Eastern roads. Agents at the eastern termini meet in convention and agree upon the charges for western-bound freights. The evidence taken by the committee shows that the principle upon which rates are adjusted on these lines is not what the services are actually worth, but "What are the rates charged by the water lines?" and "What will the property bear, in view of its movement to market?" Of the total quantity of wheat received and stored in the ports of Chicago and Milwaukee during the first three months of 1872, amounting to 4,095,487 bushels, only 286,000, or about 7 per cent., were shipped by rail during those three months, while in the month of April, when the water competition began to be felt, the railroads carried 462,570 bushels of wheat, or an increase of 62 per cent. over the shipments of January, February, and March. The effect of this competition on the movement of corn was to send forward in April 1,018,271 bushels, against an aggregate of 1,702,905 moved in January, February and March. An impression has prevailed that during the winter months all the rail lines from Chicago to the East are choked with the surplus products of the West, but the above facts seem to demonstrate that the companies prefer not to move them at all rather than to do it at rates which those products will bear. The history of railway management in every State of the Union, and throughout the civilized world, proves that competition invariably ends in combination. Hence the well-known aphorism, "Where combination is possible, competition is impossible."

Congressional Regulation Discussed.

In view of these facts, the committee proceeds to the discussion of the second remedy: Direct regulation by act of Congress. This, though untried by Congress, is by no means a novel experiment in the States or in other countries. An extensive collection of authorities, including those of England, Ohio and Massachusetts, unite in pronouncing the system practically worthless. The British Parliamentary Commission of 1872 are quoted from as condemning the following